Papers on Communications

for Information Participants

Foreign Information Training Section
Office of Information
U.S. Department of Agriculture

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Participants in the 1959 Agricultural Information Techniques Training Course see USDA exhibits designed for State extension work and for fairs abroad.

COMMUNICATIONS TRAINING FOR AGRICULTURAL INFORMATION WORKERS IN THE UNITED STATES

Communications Training For Agricultural Information Workers In The United States*

by **R. Lyle WEBSTER**, Director of Information,
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Communications training among agricultural information workers is certainly a topic in which we all need to be interested. I should make it clear at the outset that our concept of communications training, at least for people in Government, is training that makes them more articulate in presenting *facts*. We do not look upon communications training as developing our information workers as persuaders. We present the facts and leave to the people and to the private mass media the interpretation of those facts. Our Government is so large that the great need is for improved skill in the mere process of making the facts known. In agriculture, our scientific research grows increasingly complex and the need becomes greater for ability to transmit this research so that farmers may adopt it.

THE GENERAL SCOPE OF COMMUNICATIONS TRAINING

Although communications training is not new with any of us, it is true that we in America are experiencing a new and intensified interest in communications. Americans are seeking training and guidance to convey their ideas more effectively — by being more readable, more articulate, and more visual. This interest is evidenced by an almost explosive growth in communications training especially among the professionals in information such as authors, editors, artists and speakers.

Communications training is found in Government, in business, in large and small industry, in farmer cooperatives, labour organisations, and religious groups. It appears in public administration institutes and management training courses. Universities have courses, departments and colleges devoted to communications training.

A significant recent development for us in Government is the authority in the United States for Federal agencies to provide specialised training — including communications training — for certain personnel. This was made possible by an act of our Congress last year, known as the " Governmental Employees Training Act " (Public Law 85-507).

Agricultural workers are in the midst of what may be termed a veritable revolution in communications and communications training.

The agricultural phases of this " revolution " within the United States will be dealt with under the following main headings:

1. Train-the-trainer, a programme to train those who conduct communications training;

2. State training, involving the follow-up of train-the-trainer plus some specialized State activities;

3. Communications training with the United States Department of Agriculture;

4. Increases in communications research and graduate study as related to communications training.

Finally, some of the factors will be outlined which make such developments possible in the United States.

THE TRAIN-THE-TRAINER PROGRAMME

The " train-the-trainer " programme of the Land Grant College System was developed by the National Project in Agricultural Communications (NPAC); itself a creation of the Land Grant College System, with support by the Kellogg Foundation. NPAC has carried on a good many of the clearing house type of activities which FATIS has done. In addition, NPAC has stimulated enormously the development of new methods. Out of these new approaches a training mechanism has evolved which the Land Grant Colleges have eagerly adopted. It is not too much to say that the programme has brought new strength and new vision to agricultural workers all over the country.

The NPAC group developed techniques that have been of inestimable value to all agricultural information workers. They worked the new techniques into a format or a " package " which has now become well accepted and widely used.

It should be pointed out that training work had, of course, been under way for many years. The contribution that NPAC made was to give a new impetus, to enrich going programmes and to give importance and stature to the training movement.

The key operation in this project has been the " train-the-trainer " communications training programme. In this process, NPAC developed programmes that provided content, methods and basic training materials.

The train-the-trainer work of NPAC was carried out largely with State information and administrative extension workers. The States were encouraged to send teams to regional communications training institutes. These teams obtained knowledge at the institutes and then carried back what they learned to their fellow workers in the colleges, and most importantly, to their county workers, the people who communicate directly with those on the farm.

A typical train-the-trainer institute conducted by NPAC lasts two weeks, and it combines intensive periods of lectures, participation and new learning processes regarding the particular phase of communication under study. Two units have been developed and a third is nearing completion. The first unit developed was the Basic and Oral Communication Unit, in which 256 individuals from 43 States, the U.S. Department of Agriculture and various governmental and international agencies participated. The second unit developed was the Written Communication Unit. Four sessions of this unit have been completed with enrolment from some 40 States.

Currently, NPAC is developing a visual communication unit and has planned four regional sessions with this unit. Already 32 States have indicated they will participate, beginning in January or February of 1960.

It will be of interest to know that the NPAC communication unit is being adapted for use in another region of the world : in Latin America. The Inter-American Institute of Agricultural Sciences, with headquarters at Turrialba, Costa Rica, is presently preparing this programme in Spanish and adapting it for Latin American use.

Much of what has been done in agricultural communications has applied to home economics communications. A training programme for home economists has been held during October at which some 100 people from all States met at NPAC headquarters at Michigan State University for a one-week meeting.

COMMUNICATIONS TRAINING IN THE STATES

The train-the-trainer institutes have been primarily concerned with State agricultural information people. This has set off new training activity and enriched programmes already under way.

Kansas, for example, has conducted communications training for many years. In Kansas, as in many other States, the top agricultural extension information worker has seen service abroad. He has carried on training activities with Kansas county workers for many years and has a well-defined programme of communications training. The programme now has been adapted to follow the patterns of the NPAC approach and reaches some 400 employees.

Each State, on the average, put in about 372 " man days " on communications training in the two years. This training was about equally divided among workshops, individual small group counselling, and staff conferences, newsletters etc.

Here are some of the things which participants thought their training was bringing about: better visualizing; more audience involvement in better meetings; more mass awareness methods in programme planning; better pinpointing of message to specific audiences; bulletins that need less editing; better uses of mass methods to reach non-farm groups; more requests for information help; more use of direct mail, circular letters; more use of trade magazines.

Numerous workshops are scheduled in basic, oral, written and visual communication as well as photography, radio, television and publications, with written communication leading the list.

Personally, I believe NPAC methods coincided

Communications training in the States and USDA stress improved use of visuals.

with Extension Service needs. To my mind, one of the reasons why NPAC has been able to develop the training techniques which I think will be its most significant achievement, is that it has been in a position to dare to experiment. We all do some of this, of course, but too often many of us in Government employ must necessarily stick to those things that we know will work; to those methods that we know are acceptable. We do not like to run the risk of failure, especially if it costs any money. The NPAC people operated with funds from a Foundation that encouraged a little bold experimenting, so they could try new ideas, could spend money, and they knew that if some of the experiments didn't work, they would be free to keep on trying. This freedom resulted in trying many new ideas.

The men who run NPAC, struck out boldly to develop new techniques. They did not hesitate to bring into their counsel men from industry and men from the social disciplines from the universities. They applied the inter-disciplinary principle to the problem of agricultural communications. They brought to the service of agricultural information workers the best brains they could find. And the results justified their expectations.

COMMUNICATIONS TRAINING IN THE FEDERAL DEPART-
MENT OF AGRICULTURE

Along with the States, the Federal Department of Agriculture carried on numerous communications training programmes. For example, for the past seven years the USDA Office of Information has sponsored an annual visual workshop during the last week in January in Washington.

Visual Workshops

These workshops have utilized the staff and facilities of the Office of Information, plus guest lecturers from the Land Grant Colleges, business and industry. Films from Europe have been a highlight of the last two workshops.

Starting in 1953 as a motion picture conference attended by approximately 35 people, these workshops have grown to include presentations, demonstrations, and working groups in art and graphics, exhibits, still photography, and television, as well as motion pictures. More than 400 people attended the last workshop in January 1959.

Our next visual workshop is planned for 1961 as the National Project in Agricultural Communications will be conducting a series of visual train-the-trainer seminars in 1960 and we will be co-operating in those.

Trainee Programme

Another example of agricultural communications training in the Federal Department is that represented by the summer agricultural information trainee programme under the leadership of the Office of Information. In this programme we typically employ for the summer from 12 to 20 college students for work in different Department Information Offices to gain experience and also to give us summer help.

We have three main objectives in this programme: (1) to acquaint these college students with the opportunities of government employment in agricultural communications; (2) to enable the department to evaluate the students as potential career employees upon graduation, and (3) to give these students an understanding of the governmental process and work of the department through first hand experience. The programme is open to students who (*a*) have completed their junior year of college (*b*) have some course work or previous experience in information fields and (*c*) plan to make a career in agricultural communications.

Students who are selected for trainee positions are usually employed from June 15 to September 15 and work alongside professional information specialists of the Department assisting on a variety of subjects.

In the seven years of this programme, 87 students have participated, representing 40 different colleges throughout the country. On the average we select about one of each four applicants, so the competition is quite keen and we think we are getting the " cream of the crop " each year. A limited number of these students are employed by us upon graduation from college or after they have had other post-graduate experience.

USDA Graduate School

The Department of Agriculture Graduate School regularly offers a number of after-hours courses dealing with various aspects of communication. This type of training, of course, is also available in varying forms at the several universities in the National Capital.

The Graduate School also offers a course in improving reading efficiency which has resulted in improving reading speed, on the average, as much as 80 per cent. Many of those taking the course have doubled their reading rate and some have even tripled it.

Agency Staff Training

Information workers in the agencies which make up the Department of Agriculture are few compared with the total number of agricultural employees. The information workers must have co-operation of all the personnel of their agencies. In other words the

agricultural information worker is responsible only indirectly for a successful information programme. To succeed, he must train and guide and develop the agency specialised personnel for further communication.

RESEARCH AND ADVANCED STUDY IN AGRICULTURAL COMMUNICATIONS

The increase in communications training has been accompanied by an increase in research in agricultural communications. Here is some evidence of the increase in research.

First, the agricultural experiment stations have approved communications research projects. The first Federal grant money for a State experiment station project in communications research was approved about five years ago. Since then, a dozen such grants have been approved and that first project is still in operation.

Second, an inventory of communications research in the Land-Grant Colleges and universities reveals more than 130 communications studies in progress or recently completed.

Third, less than three years ago the USDA Office of Information added a person to the staff to conduct studies of our publications. We are conducting studies to learn what content is most needed in our publications, how to make the publications as understandable and interesting as possible, and how our publications are used.

Fourth, one of NPAC's activities has been the accumulation of several thousand abstracts of communications research. Although the set of abstracts is not complete, it provides facts on typography, colour, radio, television and other topics. Many of the abstracts are reported in a publication originally titled AGRI-SEARCH and more recently re-named SEARCH. Next year, NPAC will publish monographs in several areas of communication.

Another encouraging sign is the value that editors have placed on training themselves, as evidenced by the number getting advanced degrees, such as Ph. D. and master's degrees. Apart from studying for degrees, many information people improve their competence by taking part-time after-hours work at nearby universities. Some teach at evening courses.

THE AGRICULTURAL COMMUNICATIONS NETWORK

When we review what has been happening in agricultural communications training in the United States we are truly amazed and we look for explanations of this greatly increased interest.

Communications training in agriculture has occurred for several reasons. For one thing, agricultural leaders recognise that an important key to agricultural success lies in disseminating and applying research results. Another reason has been the need for agricultural workers to be more articulate as the balance of population in the country shifted steadily from farm to city. Today only 12 per cent of our population are farmers. In 1930, farmers were 25 per cent of our total. Our job as agricultural communicators extends to non-farm people in many respects.

There is still another factor which has favoured increased communication training. It is a favourable "climate of understanding" under which there has developed what I term an "agricultural communications network".

Here are some of the factors which I believe account for much of the progress of agricultural communication in the United States:

- *A tradition of government service to agriculture.* Government services to agriculture are an accepted part of the American system. Under this tradition, the providing and communicating of information to farm people is a recognized function of government. The organic act establishing the U.S. Department of Agriculture directed the acquiring and diffusing of useful agricultural information.

- *Widespread educational facilities.* Farmers have had the benefit of a public school system of many decades. Education for farm people is generally available in the lower schools and in the agricultural educational institutions of the country. An increasing number of farmers are graduates of agricultural colleges.

- *Highly developed mass media reaching most farm people continuously.* In addition to their formal education, farm people continue to learn and increase their information through the impact upon them of the mass media of communication — the press, radio, and television. These include highly developed general farm magazines, farm radio and television programmes and a specialized agricultural press.

- *Mobility of farmers.* The mobility of the American farmer, made possible by widespread ownership of automobiles, and by good roads, is another factor in the progress made in communication of agricultural information. With the ability to travel readily to all parts of the country, with the means and the inclination to get quickly to the office of the county agricultural agent, or to visit the near-

est agricultural experiment station, the farmer enhances his education and acquires new information for more efficient production.

- *Widespread farm organisation.* The highly developed national and State farm organisations with huge memberships, with their own media for reaching the farmer, and with active legislative or other Washington offices, are another important factor in the process of agricultural communications. Nearly every farmer belongs to at least one important farm organisation.

- *Substantial Congressional support.* Farm areas are well represented in Congress and agriculture has numerous strong supporters. Generous appropriations and voluminous farm legislation evidence this Congressional support.

- *The free enterprise " climate ".* In a free enterprise climate every group with an idea or a product to sell or to promote is free to do so. Agriculture has about a $40 billion annual market for goods and services. Business through advertising and public relations seeks to sell, working in large part through the mass media operated by private organisations. The lever of advertising and spur for profit in mass media constitute a powerful

mechanism for reaching the farmer, both to sell him goods and to educate him to new ideas.

A LOOK AHEAD

The complex world in which we find ourselves requires of us the latest and best in the techniques of communicating agricultural information. We need more than techniques. The trend toward more agricultural communications training challenges us as agricultural information workers to acquire a constantly expanding foundation of knowledge, skill and background so that we can best provide leadership in this training upsurge.

We need, too, to keep in mind the purpose of all this communications training, to continually remind ourselves that the things we are doing are a means to an end, not ends in themselves. Our goal is abundantly clear. Whether we work in a nation, in a small province, or in an international FATIS, our basic purpose is the same. We need to interpret for people all there is to know of agricultural research and the application and significance of that research. We need to know all we possibly can about communicating to farm people the knowledge they need to obtain their rightful share in the fruits of their labours.

Tapeng Chi, an ICA participant from Formosa, begins his training in the United States with an introduction to agricultural information work by Dr. R. Lyle Webster, Director of Information, United States Department of Agriculture.

Training In Communications And Agricultural Information For Foreign Participants

by **ROGER A. WOLCOTT**

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Currently, several hundred ICA-sponsored participants from cooperating countries receive training each year in communications and agricultural information techniques. These study programs are in addition to those provided for agricultural information workers in the United States as described by R. Lyle Webster in the accompanying article. To date the "train-the-trainer" communications programs developed and first presented by the National Project in Agricultural Communications has been offered to foreign participants mainly within the United States. However, as the impact of this type of communications training has expanded and received acclaim, some countries cooperating with ICA have begun to conduct courses adapted to suit their own cultural requirements. For example, Mr. Webster referred in his article to the adaptation of the train-the-trainer program by the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. Under an ICA contract with the Institute, the first Spanish version of the NPAC Basic Communications Training program was inaugurated in January of this year. Over thirty participants from seven Latin American countries attended the four-week course, and they in turn are conducting similar training programs for agricultural personnel in their own countries.

In November of 1959, a local communications training program was held in Jamaica under the sponsorship of the Jamaican Agricultural Society and conducted by two members of the NPAC staff. This was so successful that it was decided to hold another communications workshop in Jamaica during August 1960. Sponsored by ICA and Jamaica, the workshop will invite participants from other English-speaking countries of the Caribbean, Central and South America.

ICA-sponsored participants studying in the United States receive communications training from several sources. These programs vary in content and duration and apply to different categories of participants. (Consequently, some confusion may exist for USOM and other persons who are not familiar with the situation.) In the interest of clarifying the subject, the following describes the types of communications training available to foreign participants in this country:

1. *The National Project in Agricultural Communications,* College of Communications Arts, Michigan State University, conducts two, and sometimes three or more, special training programs a year in which the most recent findings of communications research are adapted for practical application. Designed primarily for U. S. agricultural personnel, a limited number of foreign participants can be enrolled. The schedule for the next NPAC presentation has not been announced at this writing.

2. *One-Week Communications Seminars for Agricultural Participants*—Seven land-grant colleges and one technical institute are conducting a series of one-week communication seminars for ICA-sponsored agricultural participants from overseas during the current year. These seminars provide an introduction to the basic principles of communication to assist visiting technicians to make the best use of their technical training after they return to their own countries. Included are: fundamental principles of teaching methods, visual aids, effective speaking and writing, how people learn, how to get acceptance of new ideas, how ideas and information spread in a community, extension and informal teaching methods such as demonstrations, and how to conduct workshops and meetings.

SCHEDULE FOR 1960

Feb. 15-19	Cornell University, Ithaca, N. Y.
March 28-April 1	Utah State University
April 25-29	Purdue University
June 13-17	California Polytechnic Institute, San Luis Obispo

June 20-24	Cornell University
June 20-24	University of Illinois
June 27-July 1	California Polytechnic Institute
July 11-15	California Polytechnic Institute
July 11-15	University of Illinois
July 25-29	University of Kentucky
Aug. 1-5	Utah State University
Aug. 8-12	University of Kentucky
Aug. 28-Sept. 2	Purdue University
Oct. 3-7	Louisiana State University
Oct. 31-Nov. 4	University of Georgia
Dec. 5-9	University of Georgia

3. *One-Week Communications Seminars for any ICA Participant* — A basic communications short course for ICA-sponsored participants from any subject matter field. This one-week seminar is presented almost continually throughout the year by Michigan State University under a special contract with ICA. Content emphasizes the process of introducing change and problems of re-entry after working abroad.

OTHER TYPES OF TRAINING RELATED TO COMMUNICATIONS

4. *USDA Agricultural Information Workshops for Foreign Participants*—A special short course for foreign participants specializing in agricultural information and communications is conducted by the Office of Information, United States Department of Agriculture, generally once a year during the first quarter. While the three-week course is mainly on visual aids, it includes the theory and elements of the NPAC Communications training program. It is conducted as a workshop with the participants given an opportunity to develop their skills in the preparation and utilization of teaching materials. Instructors are drawn from the corps of media specialists in the Department.

5. *Advanced Training in Agricultural Communications*—Under cooperative ICA-USDA training services, professional information specialists from other countries can be enrolled in one of several Land-Grant Colleges which provide curricula leading to degrees in agricultural journalism and communications arts. ICA has sponsored a number of foreign participants for this type of training.

6. *Communications Media Leadership — Eleven-Month Course for Foreign Participants*—At the University of Indiana, ICA-sponsored participants are given thorough training in the development and use of media and communications. After a semester of systematic work in graphics (still photography, filmstrip making, film production, writing for radio, and study in how to use these various media) the providing of full-time instructors, laboratory facilities and supplies gives opportunities for students to develop and carry out educational-type campaigns with and for community level agencies in Indiana. Enrollment is for participants working as information or communication specialists in their own countries.

7. *Communications Media Programming in Radio* —Syracuse University provides undergraduate and graduate training opportunities in radio for foreign participants. Content and duration of study programs are arranged according to the needs and qualifications of ICA participants. Those with formal qualifications may become candidates for advanced degrees.

8. *Boston University School of Public Relations and Communications*—Both short courses and one-year courses available to foreign participants, especially for persons concerned with public relations and the dissemination of information. Studies in basic principles, evaluation and research.

9. *Motion Picture Production*—One-year or two-year courses at the University of Southern California in all phases of film making. The courses are an integral part of the University curricula. The U. S. Department of Agriculture also has complete facilities for motion picture production and many participants are accepted.

10. *Agricultural Seminar for Editors, Writers and Broadcasters*—An eleven-week course designed for staff members of newspapers, farm journals or radio stations, or for publishers, station managers, and owners of newspapers, magazines or radio stations. College level training is desirable but not essential. Sponsored by ICA with the United States Department of Agriculture and the Land-Grant Colleges cooperating.

11. *Agricultural Information Techniques* — A twelve-month program for foreign participants who are engaged in the administration, instruction, preparation or dissemination of agricultural information. Course includes study of visual aids, publications, press, radio, communications evaluation and agricultural extension information services for home and farm development. College level or comparable experience desirable but not essential. Sponsored by ICA with the United States Department of Agriculture and the Land-Grant Colleges cooperating. Specialized programs are developed for individual participants in the Office of Information, U. S. Department of Agriculture, in each of these areas.

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There are numerous other institutions which provide training for foreign participants in agricultural communications, as well as many commercial and industrial organizations. They play an important role in the over-all training program on one or more aspects of communications. However, space limitations prevent the expansion of this list, but the foregoing may help to distinguish the general categories of communications training currently available to foreign participants.

In Visual Communication, as in any purposeful communication, our concern grows out of a situation or problem (or PROBLEM SITUATION) the correction or amelioration of which requires ACTION on the part of one or more persons or more organizations.

Our first steps, then, are to define the situation and, if possible, indicate some or all of the specific actions we we will take. Then this approach emphasizes concern for the kinds of ... what actions person, the kinds of attitudes we, and hold, the kinds of ... the knowledge we maybe acquire, if the problem-correcting or problem situation better fought.

But between the problem situation and action lies a great number of inter-related and specific steps. What might account them be?

Of all the steps you might mention or list, let us focus upon several that seem basic to making decisions about communication.

What is your PURPOSE? Who is your AUDIENCE? What are you trying to do? To whom are you trying to do it? What do you want them to do? Why do you pick these people and not others?

For the specific actions you desire, do you have more than one purpose for each specific audience? How many different audiences do you really have? What must they know? What must they feel? What kind of attitudes must they acquire or maintain?

These are the questions that, if answered, help determine what the MESSAGE must be for each audience, for each purpose. It is now whether it is wise to determine the general content of the message without specific consideration of purpose and audience. We might even say that the success of considering purpose in terms of audience, and audience in terms of purpose really defines the message.

But general definition of the message is not enough. There is the matter of selecting a language or code which will be understood by the audience. You must select specific bits of CONTENT out of the whole range or possible content. There is the matter of arrangement—how will you put what you want to say best together?

At this point, in logical planning, we become concerned about visual communication. We must decide whether for this purpose, with this audience, will it be best to select a CODE and TREATMENT that is All Visual, Partly Visual, or Not Visual? More importantly, what will be the basis for our decisions... customs, personal preference, boss's orders, or the path of least resistance?

Assuming the decision is to be "all visual" or "partly visual", we still have lots of decisions to make. Two things to say to me and:

(1) What visual METHOD will we use?
(2) What MATERIALS will we use in this method?

Decisions made up to this point now help us develop a specific communication PLAN--how we will treat our message visually; what generally we will use; and how we will use it. This might be called the "specification preparation" step for in many instances what happens next becomes the concern of another individual or office. This is the actual DESIGN of the sign (Whatever it may be). Specifications guide the designer; but, in the process of design, new treatments may arise. Where possible, keep the specifications sufficiently flexible to take advantage of new ideas.

After, or as part of the planning and designing steps, one must decide whether the visual or visuals needed are to be FINISHED (and, if so, produced) are to be ADAPTED from materials on hand (and, if so, how and by whom) or if they are of such nature that they can be OBTAINED (borrowed, rented or purchased) from another source.

None of the last three major steps--planning, DESIGN, or producing, supplying-obtaining---can logically be taken in their separate order, nor to necessarily in this precise order. In most instances one must take all of these factors into account simultaneously.

Another factor that cannot be ignored to the only titles, is the matter of USE. Who will use it; under what circumstances, will often make a big difference in treatment, methods, materials, planning, and design. Because you can think of visuals you might use in certain situations that you would not want others to attempt to use in the same situation?

Now, having used the visual, we hope ACTUAL results and actions of the kind we had expected and intended. Our communication job is not done until we decide how we will perform and actually carry out two other related but independent tasks. The first of these is FOLLOWUP. What should be built into our communication plan for immediate and long-range followup. How can we help people once they get back into their own situations?

Then, there is the important issue of EVALUATION. Are these done, evaluate? How do we evaluate? Some people think about evaluation as something that happens at the end, and then forget to do it, or fail to figure out how. Others argue, more sensibly, that evaluation is a part of every decision-making step, and, in addition, it is something you do between each step.

These, then, are some of the major elements in the visual communication decision-making process. The foregoing presentation has attempted to focus some attention on and identify many of the kinds of questions we must answer if the decisions we make will be sound, will lead to effective, efficient communication.

How and where do we find the answers to these questions? Some come from our own experiences, and our observations of others. Some come from individual, other from group study. But where and what do we study? None of the following is as precise as the visual indicates, but here, for your general guidance, is a way of relating the decision-making steps to three broad, general areas of study:

For analysis of purpose, audience, message, order, content, and requirements, we can hope to gain our greatest amount of understanding through study of the communication process.

PERCEPTION--A KEY TO VISUAL COMMUNICATION

When we try to explain what makes a good visual, we often find it difficult
to be short and precise. True, we do have some ready answers that often
help. Make visuals simple, we say. Use letters that are legible, colors
that are pleasing--yet contrasting, perhaps.

But if we're asked why such factors improve visuals, sometimes we're stumped.
We may even find, reluctant as we might be to admit it, that many of the ideas
we promote are based on intuition, on what "looks good." Operating that way,
some of us can get fairly close to the basic principles of design. Yet
sometimes when we think we know what will work, we also have found that the
rules don't always seem to apply. Then the next time, we try to explain good
visuals, we must insert a number of variables or exceptions to the rule.

Principles of design come close to giving us a magic formula for explaining
good visuals. But when we answer why certain design principles are effective,
we must turn to a number of perceptual principles which will help us to under-
stand the human reaction to visual presentations.

When we try to explain perception, we again run into difficulties. Most
dictionary definitions don't fit our purposes. In fact some psychologists--
who have studied perception to the tune of developing dozens of perceptual
theories--say dictionary definitions label perception as a form of knowing.
Psychologists prefer to think of it in terms of a type of process whereby
we must choose and select abstractions of different levels in order to
communicate.

The psychological notion seems especially applicable to visual communicators,
especially if we accept the idea that we who work with visuals are working
with symbols. In so doing, we have to define symbols as types of abstractions
that are known or unknown to various audiences. And finally, we should realize
that people react frequently only to parts of symbols in the total visual
impression.

In this workshop, you'll notice two general categories or points of view about
perception: sensory perception and social perception.

Sensory perception offers us a means of developing a number of the principles
of design which we now employ. The mere fact that many people have vision
defects have given us a whole range of design factors. We can determine
effective size of lettering, width of lines, and intensity of gray tones.

Color, lines, and shapes help create a total visual experience for a viewer--
and in thinking about this we begin to get involved in what we call social
perception. For a viewer's reactions to sensory sensations may be determined
by the context in which he receives those sensations. We not only must know
how to develop sensory stimulations but we also must consider why techniques
of grouping, separation, and integration help communicate context. Further,
studies in social perception have told us of the learned impact on perception
itself, indicating that many visual images simply are uncommunicative because
people are not familiar with the techniques for the symbols.

Even we, as visual communicators, make certain judgments and evaluations when we visualize a message--just as receivers or viewers do about our message. The symbols we so frequently use may omit many characteristics about the item or idea we are depicting. We must choose, select, and make decisions about the specific intent of our message, the ability of our audience to understand, comprehend, or perceive that message at least in close proximity to how we intended it to be perceived. Although only a few people are color-blind, for instance, the visual communicator cannot overlook the possibility that some of his audience may miss certain colors in his visuals unless he uses colors that everyone can sense.

Used together, sensory and social perception provide a potential means of studying personality, for each individual seems to be related to his surroundings in ways of his own making. Each individual also develops symbolic relations to the world around him and his associations are not rigidly spelled out as if his perceptual acts were only stimulus-bound. In other words such factors as interests, education, and associates all help him establish certain "predis-positions for behaviour." If we know these, we are better able to predict his reaction to certain visuals.

Perceptual knowledge then gives us a means of studying audience--in terms of individuals, in terms of groups. We can examine how man becomes aware of himself and the world about him, not only in terms of how but also in terms of why. We can then communicate more effectively to others by applying such knowledge to art, design, and the specific visual media.

Through the use of perceptual principles, we can develop functional materials that visually embody a message. We already manufacture dials which visually say "danger, turn me slowly," or "I increase volume," and thousands of signs and symbols to codify messages. Entire films, TV programs, books, or any design can gain new significance in such a manner.

These things have been possible, and will become more useful, simply because the human organism is a tuning mechanism--analogous to a radio or television receiver. We are constantly bombarded by millions upon millions of stimuli impinging upon all of our senses. It is impossible for us to take account of all of these.

What we do take account of is primarily a function of our past experiences in relation to what we are trying to do and what we expect to come from certain selected stimuli.

Consequently, a basic criterion for any message expressed visually--be it through written words, photographs, exhibits, etc.--is that it be carefully related to past experiences and purposes of the audience for which it is intended. Perceptual principles offer visual communicators a key to that end.

Utilization of Visual Aids to Communication

Information pertaining to the effective use of visual aids to communication is summarized under the headings of aid selection, instructor preparation, audience preparation, aid presentation, audience participation, and following techniques. This information was derived from a review of published materials. No rating of importance is implied in the order of presentation

A. Graphic training aids are generally selected:

1. From suitable annotated catalogues, bibliographies, etc.
2. To fill a specific instructional need.
3. To contribute to the understanding of the subject.
4. To present a logical sequence of information.
5. Which contain a high degree of technical quality.
6. Which contain accurate and unbiased information.
7. To be relevant to the subject matter being taught (this is especially true for cartoon graphics).
8. To be appropriate to the learning situation.
9. To be supplement by illustrating, and not repeating, specific points of the instructor's presentation.
10. To be suitable and appropriate in vocabulary level and approach to the intellectual level and previous experience of the class.
11. For audiences of different abilities.
    a. For an audience with a narrow range of ability, a single aid which is slightly below the average intelligence is used; with a heterogeneous group, a variety of aids is used.
    b. For dull students, aids which contain considerable detail, simple vocabulary and sentence structure, and slow rate of development are used.

B. Instructors prepare for classroom presentation of graphic training aids by:

1. Previewing the aid.
2. Deciding how to use the aid, e.g., to stimulate student interest, to clarify and expand subject matter presented by other methods, to review, to plan future lessons based on student reaction, etc.
3. Planning for "before and after" aid presentation activities and determining what students should be told to look for in viewing the aid.

C. The audience is prepared for the presentation of graphic training aids by:

1. Being given an oral preview of the content of the aid.
2. Being given additional background on the content of the aid.
3. Being shown how the content of the aid relates to their previous experience and interests.
4. Being shown how the content of the aid relates to the subject matter being taught.
5. Being asked specific questions pertaining to the content of the aid.
6. Being instructed about the important features of the aid and what should be learned from it.
7. Being instructed to "get a mental picture" of the content of the aid, to "imagine doing" that which is depicted, to rate how "your muscles feel" were you to do what the aid depicts, and "make up words and phrases" which describe the content of the aid.

D. During the classroom presentation of graphic training aids:

1. The aids are presented under conditions of minimal distraction and optimal physical conditions of lighting, ventilation, noise level, and seating arrangements.
2. All equipment is used in an unobtrusive manner.
3. The instructor stands aside from the aid and refers to it or its content with a pointer of contrasting color to the background of the display.
4. The class time allotted for the presentation of aids includes time for student questions and discussion of the aid.
5. When the content of the aid is new to the class, the instructor's presentation of its content is as slow as it can be without losing the attention of the audience.
6. Significant and novel content or technical vocabulary in the aid is brought to the attention of the student, commented upon, and stressed in presentation.
7. The following features of depicted objects are stressed by the instructor: motion, size, color, taste, weight, odor, scales, abstract figures, and symbols (e.g. maps) are also emphasized.
8. The instructor names, wherever possible, all the elements depicted in the aid.
9. The instructor used the imperative form of address and commentary which alerts and orients the student.
10. Questions directed to the students and summary statements of the content of the aid are used by the instructor before, during, and following aid presentation.
11. Repeated showings of visual aids are used to enhance the amount learned from the aid, as he reviews prior to, and after, examinations on the content of the aid and also actual practice with the depicted materials.
12. The instructor integrates other types of training aids, as well as other types of instructional methods, with graphic aid presentation.
13. Training sessions with visual aids (films) may last as long as one hour with no significant decrease in learning or viewer interest. However, slow learners may be adversely affected by long sessions; the learning material presented last is more adversely affected.

E. Active participation by students in learning from graphic aids is induced
    by:

    1. Giving student an advance assignment on the content of the aid.
    2. Announcing that an examination on its content will follow the
        presentation of the aid.
    3. Systematically giving examinations at the completion of aid
        presentations.
    4. Encouraging students to ask questions and to discuss the content
        of the aids.
    5. Giving students a study guide and/or having students fill in an
        outline or true-false check-list on the content of the aid.
    6. Having the instructor relate aid content to the experience of the
        students.
    7. Having students practice the content of the aid while reviewing it.
    8. Having the instructor give knowledge of results of questions asked
        of students pertaining to aid content.
    9. It should be noted that the techniques intended to increase audience
        participation are appropriately applied when some initial learning
        has taken place, when the task is not too complex, when the speed of
        development of the aid is not too rapid to interfere with practice,
        when guidance can be given, when students are least motivated to
        learn, and when the level of intelligence is low.

F. Following the classroom presentation of graphic training aids:

    1. The instructor reintroduces the problem or topic to which the aid
        is relevant and reviews the content of the aid.
    2. Such reviews or follow-ups of aid presentation are usually done as
        soon after the aid presentation as possible.
    3. The review of the aids includes summary discussions and statements
        by the instructors, questions and discussion between the instructor
        and students, examinations on the aid content, and student viewing
        of other pertinent aids or reviewing of original aid.
    4. The instructor uses such student responses as questions, discussion,
        comments, test results, etc. as a measure of the level of learning
        from the instruction and graphic aid. Such measures are also used
        as a measure of the adequacy of the instruction and aid.

Use Color to Attract and Hold Attention

Color is the most powerful factor in display and exhibits. The optical
and psychological aspects of color can be used to the greatest advantage
in attracting attention, holding interest, and most important, influencing
your audience.

Here is a list of color combinations which may help you to select colors
for your exhibits. The first column gives accent colors--colors to be
used as a "splash" or in a small quantity. The second column gives prop
colors. These are the colors to be used on risers, and other props used
to display objects, etc. The third column gives background colors.

Accent (Splash to capture attention)	Props (risers, boxes upon which exhibit objects are placed or "shown off")	Background
Green	Chartreuse	Light Yellow
Violet	Lilac	Light Gray
Brown	Ivory	Beige
Red	Pink or Black	Light Gray
Blue	Light Blue	Light Gray
Blue and Gray	Light Blue	White
Violet and White	Medium Gray	Pink
Red and Gray	Ivory	Light Yellow
Blue and Pink	Light Blue	Chartreuse
Brown and Green	Beige	Light Green
Black and White	Light Gray	Chartreuse
Black and Light Blue	Medium Blue	Light Gray
Black and Pink	Deep Pink	Light Blue
Black and Violet	Orchid	Pink
Black and Green	Light Green	Light Yellow
Blue and Silver	Medium Blue	Light Gray
Brown and Gold	Russett	Light Orange
Brown and Beige	Medium Green	Ivory
Red and Yellow	Cream	White
Orchid	Light Green	Ivory
Green and Gold	Peach	Oyster White
Green and Beige	Cream	Ivory
Pink and Turquoise	Black	Chartreuse

Some of these combinations may seem unusual but you will find they will
work magic--to attract--to hold attention--and to sell your message.
These are only a few combinations--they are endless and always a new
challenge to the visualizer.

An important source of color "know-how" for exhibits is current fashions.
Each season certain colors are "in fashion." Take advantage of these
colors in fashion and plan your color schemes for your exhibits accordingly.
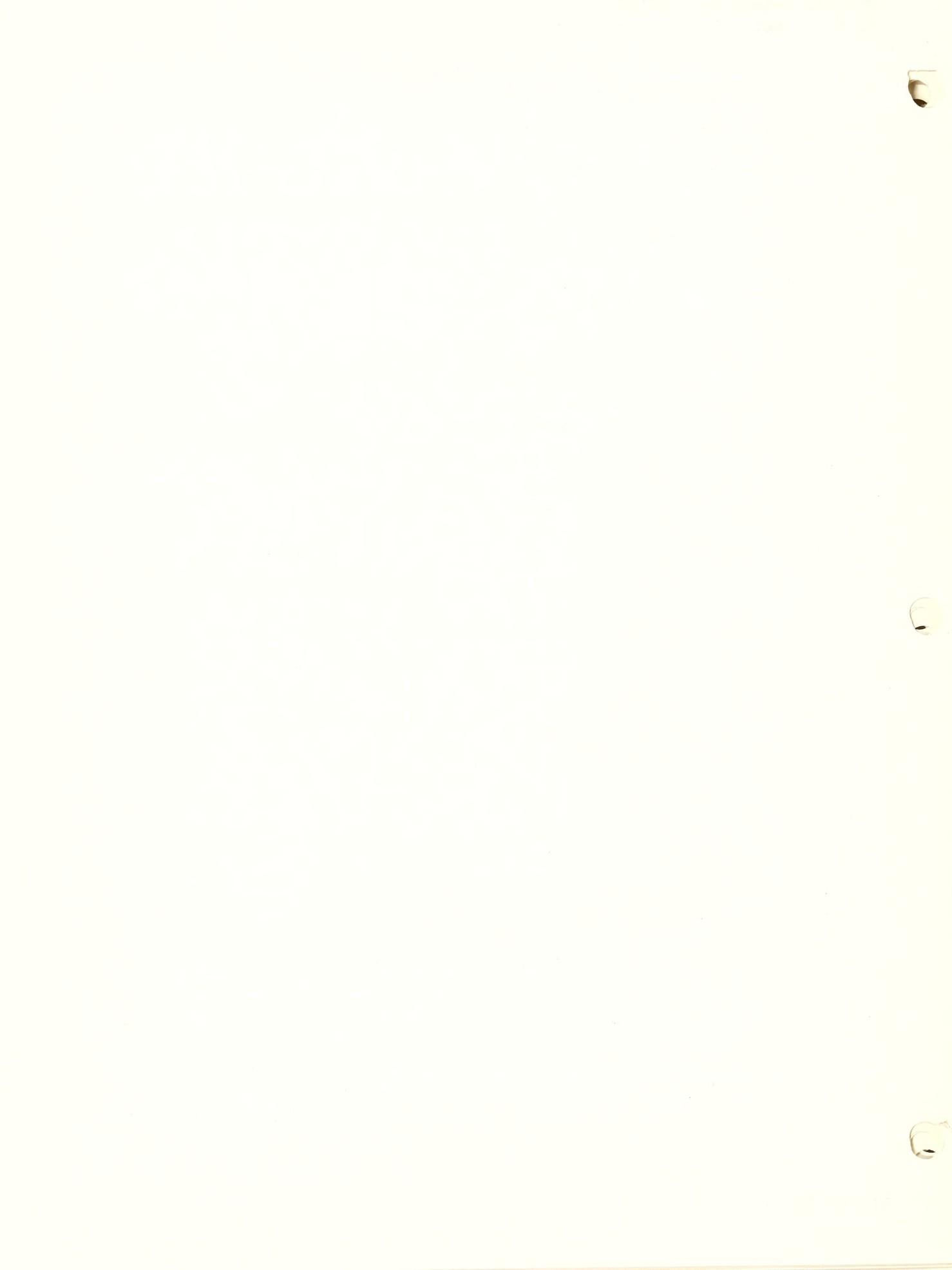
Tips and References on Visual Media

Slides and Filmstrips

Sources of 2 x 2 Slides

Hundreds of sources exist for professionally made 2 x 2 slides. By watching for "leads" in audio-visual, government, and photography publications, one can (and should) build up an extensive catalog file of sources of such ready-to-use slides that can often be used effectively in your own work. The following publications will serve as a starting point for such a source file:

Art-Work Size Standards for Project Visuals. Pamphlet No. S-12, Eastman Kodak Company, Rochester 4, New York.

Color As Seen and Photographed. Pamphlet No. E-74, Eastman Kodak Company, Rochester 4, New York.

Foundation for Effective Audio-Visual Projection. Pamphlet No. S-3, Eastman Kodak Company, Rochester 4, New York.

Legibility Standards for Projected Material. Pamphlet No. S-4, Eastman Kodak Company, Rochester 4, New York.

Rothschild, Norman and Wright, George B. Mounting, Projecting, and Storing Slides. Universal Photo Books, New York, 1956. (See pp. 116-117 for "Various Sources of Color Slides.")

Some Sources of 2 x 2-inch Color Slides. Sales Service Division, Eastman Kodak Company, Rochester 4, New York.

Where to Buy 2 x 2-inch Slides, A Subject Directory. Enoch Pratt Free Library, Baltimore, Maryland.

The book by Rothschild also contains worthwhile chapters on how to bind, store, and index slides and how to organize a slide program.

Do-It-Yourself Slide Productions

Slides often can be produced by amateur photographers and the 35mm camera is ideally suited for this purpose. A great amount of how-to-do-it material on the subject is available from camera stores, photography books and amagazines as well as audio-visual education publications. Here is a useful listing of worthwhile books and films you may want to consult.

Coltharp, Joe. Production of 2 x 2 Inch Slides for School Use. Visual Instruction Center, Division of Extension, The University of Texas, Austin, 1958, pp. 79.

Photographic Production of Slides and Film Strips. Eastman Kodak Company, Rochester 4, New York, 1955, pp. 53.

Motion Pictures:

How To Make Handmade Lantern Slides. 21 minutes, sound, color, $150; black and white, $75.

Photographic Slides for Instruction. 11 minutes, sound, color, $100; black and white, $50.

Handmade Materials for Projection. 20 minutes, sound, color, $150; black and white, $75.

High Contrast Photography for Instruction. 14 minutes, sound, color, $100; black and white, $50.

Slides Versus Filmstrips

Comparison of these similar media provide a good way to consider the unique advantage of each. For instance, slides have these advantages over filmstrips:

1. The sequence or order in which the pictures are to be shown can easily be changed.

2. Satisfactory individual slides are somewhat easier to make than the filmstrips of a similar quality.

3. When slides are properly mounted in glass, their surfaces will last almost indefinitely without scratches or other damage.

Filmstrips have these advantages over slides:

1. Obviously, the frames in a filmstrip are in a fixed order and cannot be changed, accidentally or otherwise.

2. Picture per picture, filmstrips generally cost only a small fraction of what its individual pictures would cost if they were purchased as individual slides.

3. Filmstrips require much less storage space and postage, and they are generally non-breakable.

4. A much wider range of commercially prepared subjects are available as filmstrips rather than slides.

Effective use of slides and filmstrips depends upon a great deal of active participation by the instructor. In fact, these visual devices demand that the instructor play an active role in reacting to them and in so doing they often bring out the best in an instructor. The ability of an instructor to actively relate himself and his verbal presentation to the visual content of projected visuals is closely related to his knowledge of the visual material. It is, therefore, unwise to use any kind of visual material with a group until you have become fully aware of its content and its teaching potential.

Where To Find Filmstrips

Filmstrips are available on a wide range of subjects related to agricultural extension work. Many are available without cost. The best source of information on such filmstrips is the Educators Guide to Free Slidefilms, published annually by the Educators Progress Service, Randolph, Wisconsin.

This cross-indexed reference lists and describes several thousand film-strips that may be had without charge. These materials are made available free because they are sponsored by a business or some other "special interest" group willing to spend its money to present its message to your audience. Such sponsored materials should not be given a blanket condemnation (or approval), but rather should be judged on individual merit. As a matter of fact, some of the best visual materials available on certain subjects are materials underwritten by business interests.

The most comprehensive reference work in print on available filmstrips is the H.W. Wilson Company's Filmstrip Guide, an annotated listing by subject and title of some 10,000 filmstrips available for educational use. This cumulative subscription service, found in many libraries, contains the names and addresses of all major filmstrip producers in the United States. There is no comparable index of 2 x 2 slides.

Motion Pictures

The motion picture is a most unique medium of visual communication with a language of its own and special techniques that cannot be duplicated in any other medium. (Television may be considered an exception to this; however, it in turn may be considered simply as an electronic extension of the motion picture.)

Some of the unique contributions of the motion picture are:

- Ability to reproduce motion
- Ability to slow down motion
- Ability to speed up action--time lapse
- Animation possibilities

The following books will supply the beginner with an excellent background for a more complete understanding and appreciation of the motion picture:

Brodbeck, Emil E. Handbook of Basic Motion-Picture Techniques. New York: McGraw-Hill Book Company, Inc., 1950.

Grierson, John. Grierson on Documentary. New York: Harcourt Brace and Company, 1947.

May, Mark A., and Lumsdaine, Arthur A. Learning From Films. New Haven: Yale University Press, 1958.

Rotha, Paul. The Film Till Now. New York: Funk and Wagnalls, 1949.

Spottiswoode, Raymond. A Grammar of the Film. "An Analysis of Film Techniques," Berkeley: University of California Press, 1950.

Spottiswoode, Raymond. Film and Its Technique. Berkeley: University of California Press, 1951.

Starr, Cecile. Ideas of Film. New York: Funk and Wagnalls, 1951.

Selecting Motion Pictures and Other Visual Media

"Selecting" motion-pictures, filmstrips, slides, and other commercially produced audio-visual instructional materials is a continuing activity that can perhaps best be viewed as three important steps in the teaching process.

Once the teaching objectives have been clearly established, it is necessary to identify materials that can be used to accomplish these objectives. Keeping informed of existing audio-visual materials plus new releases is in itself a considerable job. A number of standard reference works listing and describing such materials are available.

In addition, many producers publish helpful catalogs, and educational periodicals often contain specialized listings and reviews of such materials. The Department of Audio-Visual Instruction of the National Education Association, made up of nearly 5,000 audio-visual specialists, publishes much helpful material.

After potentially useful materials have been identified but not previewed, it will be necessary to procure them for further consideration and possible class use. When materials are to be purchased, this is a relatively simple matter. However, it is often necessary to obtain motion pictures on some kind of rental basis. This procedure often presents the problem of locating a reasonably local source from which a particular film can be rented at the appropriate time. It is important, therefore, to be familiar with film rental sources in your locality. A Directory of 3,660 16mm Film Libraries* will be a useful resource for this purpose. Film rental libraries often publish descriptive catalogs.

There are a number of standard sources of information on 16mm motion pictures. No single source of film information is complete and there is often a lag of a year or more between the time a motion picture is released and the time it will be listed in such standard works as the following:

Educational Film Guide (11th edition, 1953 plus 1958 supplement), H.W. Wilson Company, New York.

Comprehensive annotated listing by subject and title of nearly 20,000 16mm motion pictures plus a directory of producers.

Educational Film Library Association, Inc., 250 West 57th Street, New York 19, New York.

*A Directory of 3,660 16mm Film Libraries. U.S. Office of Education, 1959, p. 236, $1.00.

Film reviewing service that supplies 3 x 5 cards on new films to members.

Educators Guide to Free Films, Educators Progress Service, Randolph Wisconsin. Annual.

Descriptions of several thousand 16mm motion pictures available on free loan from business and industry.

Educational Television Motion Pictures, NET Film Service, Audio-Visual Center, Indiana University, Bloomington, Indiana, 1958, free.

Descriptive listing of 777 educational television programs on 16mm film available for non-TV use.

Reid, Seerley, U.S. Government Films for Public Educational Use, U.S. Office of Education, Bulletin 1955, No. 1, plus Supplement No. 1, Bulletin 1957, No. 6.

When you view motion pictures that might conceivably be used at some future date, it is a good plan to make some kind of a written record of these motion pictures. There are many so-called film evaluation forms, any one of which you may wish to adapt.

In a year's time, anyone engaged in visual communication is apt to see hundreds of motion pictures. He is equally apt to remember little about a specific film, thus the value of a record of the filsm seen along with notes on the personal reaction.

The Seven Deadly Sins of Flannel Board Use

1. "Symbol-waving". The speaker grabs a visual--or handful of visuals--generally with an axe-handle grip. If speaking vigorously at this point he chops or jabs at the audience with the visuals as his weapon. If not, he either teases the audience with subtle glimpses of the words to come or gives them a clinical view of the way in which the backing was placed on the cards.

2. "Discarding". This interesting practice occurs when the speaker brought more symbols than he can use and failed to arrive in time to sort them out in advance. He leans over the stack, studies the next symbol briefly, decides not to use it, tosses it aside, studies the next, and so on. By this time the audience is far more intrigued by the unseen than it could ever hope to be by the seen.

3. "Anticipating". This occurs when the speaker lets the hand anticipate the voice. In this contest, the voice hasn't got a chance. The minute--the very instant--the symbol is revealed, every mind in the audience will be registering its meaning. Not only will they miss what he is saying but they will have already lost part of their interest in what he is about to say. So he loses both ways.

4. "Troweling". The speaker not only places the symbol carefully but fondly smoothes it and flattens it with the sensitive gestures of a craftsman using his trowel to finish a freshly laid batch of concrete. By this time the audience is far more interested in the pantomine than in the idea which the symbol represents beneath the speaker's waving hand.

5. "Backsiding". The speaker turns away from the audience as if more fascinated by the artistry of his handiwork than by the personalities he is trying to reach. Nobody can arrange symbols in good pattern without momentarily turning toward the board; the only alternative is casual "slapping" of the cards on the board in some inevitable disarray. But the interval of loss of eye contact with the audience can be so momentary as to be almost unnoticed.

6. "Blocking". Any position taken by the speaker which blocks all or part of the view of the board by any part of the audience is not only self-defeating but lacking in good manners. Here again, momentary blocking is unavoidable. And it should be noted that if you really want your audience to forget the visuals for a moment while you make an extraneous point, the block can be put in for that purpose.

7. "Telecoping". If the speaker places a series of symbols on the board in such rapid sequence that the audience does not have ample time to register the meaning of each, he will find that they understand none. This practice might be described as "telecoping" or jamming one symbol on top of another.

Avoid those errors in these ways:

If you sense that your audience--or most of it--is seeing the board for the first time, take a moment at the outset to remove all the mystery. Tell them, briefly, how it works. Give it a little build-up. Otherwise they may be more concerned with trying to figure it out than in hearing what you have to say.

Use your hands not just to place symbols on the board but to give them emphasis. Point to the symbol you are discussing, sweep your hands around a set of symbols if you are discussing them collectively. If you make a second reference to a given symbol, adjust it slightly on the board or even move it to draw attention to it once again. But never forget that there is only one maximum point of interest in the life of any symbol and that is the moment when it is first exposed to view. Capitalize on that.

Prepare with special care for those moments of greatest difficulty--the periods of transition from one stage of your visualization to the next. As you remove the symbols which you have used, talk about them or review what you have said or--better still--explain how they prepare the way for the next stage.

Once you have mastered these fundamentals--and they are not really complicated or difficult--you are ready to move on to that limitless field of sheer artistry known as "bringing the audience into the act." This is the big payoff. This is where the whole thing ceases to be a burden and starts to be fun.

There is, for example, the device of the momentary delay. Suppose you are building up to a climax point; but just before you slap that point on the board, you pause. That moment of suspense then sends your point smashing home with twice the force it might otherwise have had.

Again, there is the dramatic effect which you can get out of change-of-pace. After moving along through a stage of your talk at a slightly increasing pace, you suddenly make the big point and then say nothing. The silence gives an emphasis that words could not accomplish.

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Source: Instructional Film Research by Charles F. Hoban Jr , and
           Edward B. van Ormer, 1950, pp. 9-2 to 9-9.

I. Principle of reinforcement

Films have greatest influence when their content reinforces and extends
previous knowledge, attitudes, and motivations of the audience. They have
least influence when previous knowledge is inadequate, and when their content
is antagonistic or contrary to the existing attitudes and motivation of the
audience. But you can't expect a film to do the job alone--just as a single
experience can't change attitudes, etc.

II. Principle of specificity

The influence of a motion picture is more specific than general.

III. Principle of relevance

The influence of a motion picture is greater when the content of the
film is directly relevant to the audience reaction that it is intended to
influence.

IV. Principle of audience variability

Reactions to a motion picture vary with most or all of the following
factors: film literacy, abstract intelligence, formal education, age, sex,
previous experience with the subject, and prejudice or predisposition toward
the subject We need to emphasize and be aware of visual literacy--the
danger of abstractions.

V. Principle of visual primacy

The influence of a motion picture is primarily in the strength of the
visual presentation, and secondarily, in the narration or commentary. It is
relatively unaffected by "slickness" of production s long as meaning is
clear.

VI. Principle of pictorial context

An audience responds selectively to motion pictures, reacting to those things which it finds familiar and significant in the pictorial context in which the action takes place.

VII. Principle of subjectivity

Individuals respond to a motion picture most efficiently when the pictorial content is subjective for them.

VIII. Principle of rate of development

Rate of development influences the instructional impact of a motion picture on its audience. This is hard to manipulate once it is built into a movie. If you want to stop, build in a "STOP" into the movie.

IX. Principle of instructional variables

Established instructional techniques, properly built into the film or applied by the instructor, substantially increase the instructional effectiveness of a film.

X. Principle of instructor leadership

The leadership qualities of the instructor affect the efficiency with which his class will learn from the film or filmstrip.

Demonstrations can be divided into three parts:

1. Know the background of the audience.
2. Have materials ready before the demonstration.
3. Plan carefully and rehearse the plan well.

PREPARATORY WORK

Prepare audience for what they are to see demonstrated.

ACTUAL PERFORMANCE

1. Keep it to level of audience.
2. Be sure everyone is placed in a position to see and hear.
3. Do not hurry but do not drag.
4. Do not digress.
5. Summarize as you progress.
6. Clarify KEY POINTS with illustrations.
7. Check frequently for comprehension.
8. Repeat processes that you see are not being grasped.
9. Ask for and answer questions and exchange ideas.
10. Use additional aids if occasion requires it.
11. Something may go wrong. Tell your group what happened and why.
12. Do not lose the audience because of a poor balance of talk and action or because the demonstration is hurried or dragged out.

EVALUATION

1. Follow-up; check for feedback.
2. There must be self-evaluation.

fig. 1

A Simplified Stencil for Lettering
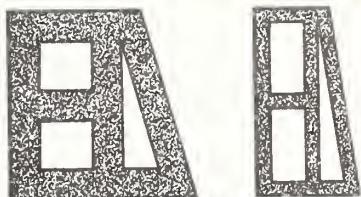
Drawing letters on posters, exhibits, and displays is a technique of design. It is a simple task which can be executed easily by any person gifted with a sense of observation and with the aid of a stencil.

Here is a stencil which helps draw every letter in the Roman Alphabet. You can make it from most any material.

How To Make The Stencil

1. Obtain a small piece of smooth, stiff material such as paper, zinc, or celluloid.

2. Trace the design of the stencil (fig. 1) on the surface of the sheet of paper.

3. Cut around the stencil with a sharp knife.

4. Vary the height and the width of the stencil according to the kind of letters you want.

How To Use The Stencil

1. Trace a base line for the alignment of the letters (fig. 2).

2. Draw the contour of the desired letter (fig. 3).

3. Complete the interrupted tracings with a ruler, and around the corners with free hand.
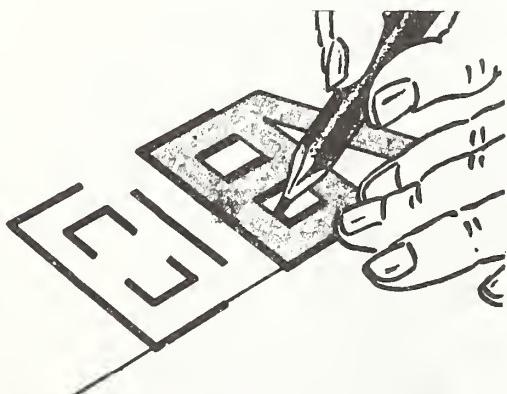

fig. 2
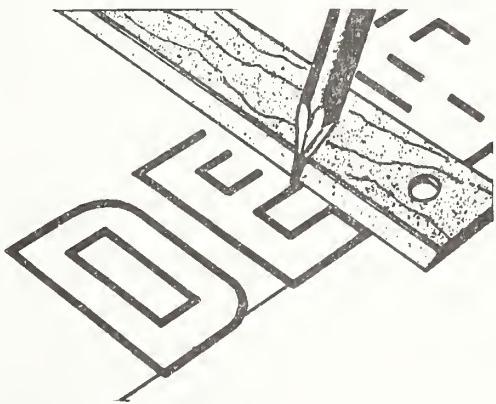
fig. 3

SUMMARY OF FINDINGS FROM THE AREAS OF PERCEPTION,
AESTHETICS, AND ART RELEVANT TO THE DESIGN
OF
GRAPHIC TRAINING AIDS

A. Organization, layout, and general design principles.
  1. General
     a. The organization of a designed pattern should have <u>unity</u> and <u>interest</u>.
        Unity includes a closed pattern of movement, proportional relation-
        ships of size, number and degree, and rhythm. Interest is attained
        through variety.
     b. Unity in a picture is enhanced by proportioning elements on the basis
        of simple ratios and by the rhythmical repetition of basic ratios and
        patterns.
     c. To obtain harmonious whole-part relationships either assemblage and
        grouping of an arithmetical order or progressions of a geometrical
        order should be used in grouping shapes.
  2. Figure-ground relationships
     a. A design is a figure-ground pattern in which the background is as
        important as the foreground even though the observer attends pri-
        marily to the latter.
     b. An object that appears in front has the characteristics of a thing,
        has form, clear contour lines, suggests meaning, interrupts other
        objects, tends to be seen as the figure in the figure-ground
        relationship.
     c. Low energy and low contrast areas in the visual field blend into
        <u>ground</u>; high energy and high contrast constitute <u>figure</u>.

B. Grouping factors
   Grouping of objects in the visual field occurs when the objects or units
   involved are:
  1. In close proximity to each other
  2. Similar in size, shape, and color
  3. Move in a uniform direction
  4. Form a continuous or closed line or figure
  5. Are usually or have previously been seen together

C. Balance and symmetry
  1. General
     a. Balance refers to the equilibrium of opposing forces around a central
        axis or a point in the field. Three types of balance have been de-
        scribed: axial, radial, and occult.
     b. The left and right halves of a picture attain balance when the
        weights in one half are equalized with those in the other half.
     c. The "weights" in a picture which must be qualized in creating a
        balanced composition are mass, direction, interest, and vista.
     d. In general, greater weight is needed in the lower half of a picture
        if the upper and lower halves are to be balanced.
  2. Observer responses
     a. Eye movements do not distinguish reliably between pictures of
        different balance relationships
     b. Eye movements do no reflect the extent or direction of visual
        illusions or the perception of symmetrical or asymmetrical re-
        lationships.

D. Proportion and shape
    1. General
        a. Preferences for different forms, in varying proportion-ratios, show large individual differences. There is no decided preference for forms having the exact ratio of the golden section, although there is a tendency for preferences to cluster near those forms having this ratio.
        b. Preference for simpler forms increases with increasing age and experience in art.
    2. Specific
        a. A form tends to be a figure set upon a ground, possessing symmetry, balance, and proportion and may vary in articulation, strength, stability, meaningfulness, etc.
        b. Of isosceles triangles varying from 0.25" x 1" to 3" x 1", those in the modal range (1" x 1" through 2" x 1", altitude to base ratio) are most liked by observers, supporting the general conclusion that forms showing moderation and simplicity are preferred.

E. Line
    1. Lines of different types may express different moods. Observers tend to agree that:
        a. Big downward or horizontal curves are weak, sad, lazy, quiet, or gentle.
        b. Small, medium upward, or horizontal curves are playful or merry.
        c. Small, horizontal or upward angles and curves are agitating, furious, or hard.
        d. Medium, upward or horizontal angles and curves are powerful.
    2. Curved lines are tender and sentimental, severe and typical, playful and graceful; straight lines are sad and dignified.

F. Color
    1. General
        a. Colors should be used artistically and truthfully.
        b. Colors affect and are affected by other colors in the visual field. The actual nature of the changes that occur with continued exposure is related to hue, saturation, and brightness relationships, as well as to the proximity and definition of the color fields.
        c. Unity may be established in a picture by the use of color. A dominant unity may be established by using one hue, a limited number of hues, keying toward a dominant hue, or establishment of a dominant color temperature.
        d. Contrast is best established through value (brightness) contrast but hue and intensity contrast may also be used.
    2. Preferences
        a. Single colors.
           Blue and red are the most preferred colors; yellow and orange are least preferred.
        b. Colors in combination
           Very large and very small differences in hue are preferred in color combinations.

3. The appearance of colors
   a. Lighter colored objects appear larger than darker colored objects.
   b. Darker colored objects appear heavier than lighter colored ones, even though the actual objects are identical in size, shape, and weight.
   c. Warm colors seem to advance, appear heavier, denser, and larger than cool colors which appear to recede, seem smaller, and lighter in weight.
4. Meanings assigned to colors
   Colors varying in hue, saturation, and brightness convey different feelings:
   a. Saturated red, orange, and yellow seem warm.
   b. Blue of low saturation seems cold.
   c. Light colors are breathlike and pale, never intense.
   d. Grayish, whitish, and blackish colors are gloomy, never cheerful.
   e. Saturated colors are never weak.
   f. Red is called happy and exciting; blue is called sad, severe, and dignified.
5. Brightness factors
   a. The brighter of two similar objects appears larger and closer than the less bright one.
   b. Large value (brightness) contrasts are preferred in color combinations.

G. Depth
   1. General
   a. Depth is most satisfactorily represented on a two-dimensional surface if the observer is not required to make eye movements of convergence or accommodation.
   b. A scene can be simplified by using a number of imagined planes, located parallel to and behind the picture plane. Objects at various distances are then allowed to fall into planes defined by their contours and the details of the object are subordinated to the plane in which the object appears.
   c. A suggested direction of gaze in viewing pictures is commonly obtained by placing nearer objects to the right, left, or center on the frontal plane. Objects at greater distances are then located on planes behind the frontal plane.
   2. Monocular cues to depth
      a. Brief summation
         Four general types of monocular cues to depth have been enumerated in the literature:
         i   Perspective cues in which there is a diminution in angular size of objects and in their decreased spacing with increasing distance.
         ii Perspective cues in which atmospheric effects cause changes in color and definition of objects with increasing distance.
         iii Cues to three-dimensional form given by light and shade (involving use of shadows, etc.).
         iv Cues in which more than one object or objects in sequence are presented in relationship to each other by superimposing, interposing, and overlapping of objects, and by placing the more distant objects at relatively upward locations on the picture plane.

    b. Some observations
        i   Loss of definition of outline and increase in amount of blue
            coloring serve to make objects seem more distant.
        ii Changes in relative size and/or relative illumination of an
            object are perceived as changes in relative distance.
        iii The estimated range of aircraft shown pictorially on slides
            increased as the size of the aircraft within the picture frame
            was reduced, although the estimations tended to remain constant
            when the distance between the observer and the screen was in-
            creased.
        iv Overlay (or interposition) is a stronger cue to distance than
            relative size.
 3. Effect of training and past experience
    a. Three-dimensional relationships in diagrammed form are recognized by
        artistically trained and untrained subjects.
    b. Training in two-dimensional design tends to block the perception of
        three-dimensional relationships.
    c. Three-dimensional wire forms, shown as stationary two-dimensional
        projections, were seen initially as two-dimensional figures. Moving
        exposures of one or more of the figures by rotating them was effective
        in changing the perception of the stationary two-dimensional pro-
        jection to one of three-dimensionality.
H. Other factors
 1. Recognition and meaning
    a. Exposure time
        i   Brief initial exposures of pictures (for $\frac{1}{4}$ sec intervals) per-
            mits recognition of general masses such as a human figure,
            large common objects, etc. With successive exposures, greater
            and greater concentration upon small areas and fine detail is
            found. Integrative verbal responses to value-relationships,
            line, balance, etc. generally occur only with artistically
            trained observers after many exposures of the picture.
        ii Changes in emotional response will occur with protracted ob-
            servation of a painting; the exact nature of the change will
            depend on the type of painting observed.
    b. Type of depiction
        i   The recognizability of a particular object depends on the view
            of it that is shown.
        ii Marked deviations of a silhouette of the human head compared
            with a "standard" silhouette were disliked by most observers.
        iii Abstract and semi-abstract art is generally not understood or
            comprehended by most individuals.
        iv Naive subjects preferred photographs to paintings of the same
            subject matter even though the paintings had been rated as
            having greater unity.
 2. Training
    a. No statistically significant differences were found for aircraft
        recognition when the observers had been trained to identify the
        overall form of the plane or some distinctive feature of the plane.

   b. Tachistoscopic training with digits was found to improve the rec-
       ognition for objects, to increase reading comprehension and speed,
       and to enlarge the visual field for form perception although the
       significance of this training procedure for recognition is question-
       able.
3. Memory
   a. Figures reproduced from memory showed decrease in area of the figure
       from an original immediate reproduction.
   b. Generally, evidence for progressive changes in reproduced figures in
       the direction of "better" figures is meager.

EVALUATION

The information obtained from the related references in the areas of art,
experimental aesthetics, and psychology range from concepts widely accepted and
utilized in all three areas to specific findings, from a relatively limited
portion of an area, which are highly controversial. Between these two extremes,
studies have been found which have implications for one or more general topics
in this report. Other sources have been found which clarify specific factors
involved in graphic training aids, while others must be evaluated within a par-
ticular design framework. In still other studies experiential data are cited
which have possible immediate usefulness and also suggest areas for future
inquiry and research.

The findings and techniques involved in the representation of depth are
perhaps the most consistent and generally applicable ones encountered in the
literature. The role and importance of monocular cues in the perception of
space and distance is generally acknowledged by most writers. These cues, when
transformed or translated in terms of a two-dimensional artistic presentation
should provide the viewer with maximum amounts of information, although normative
data have not been found in this area. Whether or not the employment of one or
more of these monocular cues is effective in inducing inevitable and immediate
perception of depth remains to be determined. One can only indicate that: (1)
there is general agreement about the important factors involved (note: although
the terminology employed varies considerably from study to study, examination of
the data leads to the impression of considerable consistency in enumerating the
underlying physical variables); (2) there is some evidence to indicate some of
these cues are important in everyday perception; (3) systematic investigation
of basic pyschological factors has been undertaken.

There is also agreement between psychologists and artists about the pro-
portions used in visual presentations, although this agreement is negative
rather than positive. The findings from psychology are as inconclusive as those
from art. Both these areas indicate slight preference for values near the golden
section, but actual practices and individual preferences show a wide range of
acceptable values.

The particular aspects of a picture which are related to movement or balance
have not been clearly defined in quantitative terms although some general de-
scriptions can be obtained. It is also possible to get some observer agreement
about balance or absence of balance in a particular presentation, but when
objective behavioral data are sought in the eye-movement responses to pictures
possessing or lacking balance or symmetry, negative findings are reported.

Considerable agreement is found concerning the appearance of colored objects, both from art and from research in experimental aesthetics, although the affective and cognitive responses to color are somewhat more complicated phenomena. However, since there _is_ some consistency in color preferences, it is possible to make general recommendations about color usage.

Two important areas in which it is most difficult to define the main variables are, organization of the display and the perception of form. Observations about perception from the psychological literature about certain aspects of organization and figure-ground relationships, are suggestive of principles which might be applied to a graphic design; however, with extremely complex material their direct applicability and usefulness is not clear.

As visual presentation becomes increasingly complex, moreover, or as the observer's task shifts from a visual to a cognitive one, other factors begin to emerge as important. Descriptions and classifications of the composition and organization of artistic material have been attempted, and four studies, reflecting psychologically oriented artistic approaches to this problem, are cited. A fifth study, attempting to systematically analyze and describe basic variables in pictorial representation, shows a somewhat different approach to the problem. In this study Gibson attempts to establish a meaningful theoretical framework within which systematic experimentation might be carried out.

In addition to the more general approaches to pictorial art, the reader will find selected studies dealing with the amount of permissable distortion of form, the effects of protracted observation, set or previous training, memory, and other complex aspects of the response situation which influence observer performance. Overall evaluation of the studies concerned with the role of training or past experience upon perception and recognition leads to tentative acceptance of the positive evidence in this area. Although training with tachistoscopically-exposed digits may not be the most effective training procedure, considerable agreement about the value of artistic training in modifying the observer's interpretation and recognition of paintings has been found. These studies, together with those concerned with the role of past experience on perception of depth, and those from other areas, suggest that past experience and training are probably most basic in bringing about understanding from graphic material.

In addition to the limitations mentioned above, two other factors appear to restrict the general application of data from the area of art to the design of visual training aids. The first of these relates to the commonly expressed notion that any single rule or principle of artistic design may be violated without losing a desired effect, if suitable compensatory principles are applied (e.g., though warm colors advance in a visual field and cool colors recede, cool colors may be made to advance if appropriate variations are introduced into the display). The second limitation in applying artistic principles to graphic aids' design relates to the problem of the viewer's hedonic response to visual art. In this regard, there exists a plethora of data and opinion on those principles of artistic design which induce emotional reaction on the part of the viewer. Such data appear to have doubtful application to training aid design, wherein the emphasis is usually on the communication of factual information. Only to the

extent that aesthetic considerations enter into the viewer's acceptance of the visual presentations are such findings applicable to the design of the training aid.

In summation, it seems that the areas reviewed do offer useful, readily applicable, findings for certain aspects of the design of graphic aids. Other factors, however, may only be approximately specified or described, and more information as well as future research in these areas seems necessary. The literature, in general, suggests, rather than definitely indicates, an approach to the formulation of design principles.
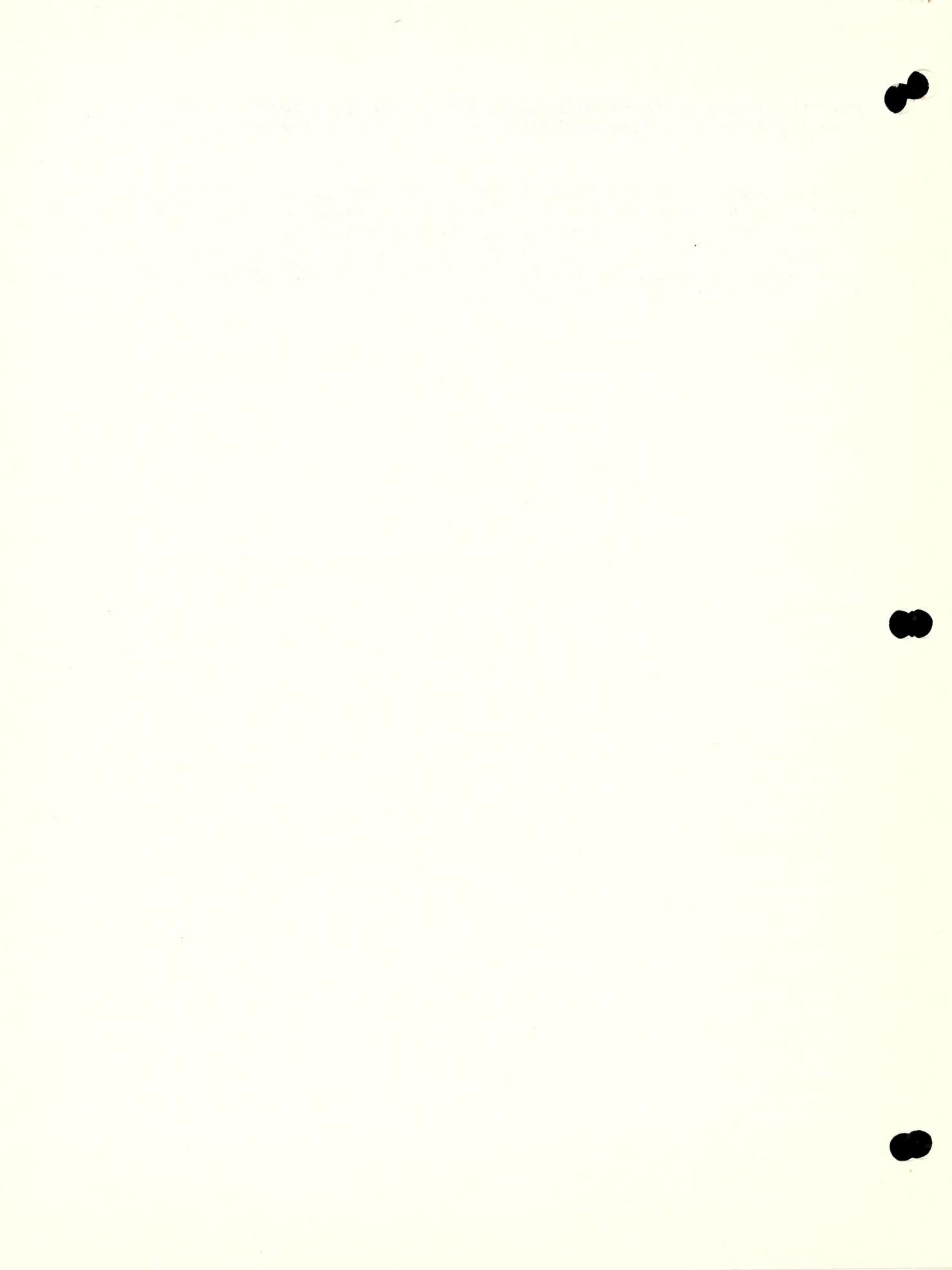
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The following is a summation of the more definitive and concrete conclusions
and findings of the reviewed literature in the area of audio-visual education
pertaining to the design and preparation of graphic training aids.

A. Design and selection of photographs
   1. Photographs should have a clear-cut center of interest, not usually in
      the geometric center.
   2. Photographs should have clarity, sharpness, and strong contrast.
   3. Photographs should not give false impressions.
   4. Pictures which are truthful, vivid, have a good center of interest,
      and contain some already familiar elements are seen as interesting and
      stimulating.
   5. Photographs are most effective when they do not include too many items,
      they emphasize the principal parts by shading and color, they are accom-
      panied by a good caption, they use arrows or other conventional symbols,
      they eliminate unnecessary detail.
   6. The instructor must use his own judgment in determing the optimal amount
      of detail, the appropriate degree of abstraction, and the necessary
      number of concepts to include in a photograph.
   7. Good photographs, which are interesting and artistic, make for a good
      film strip.
B. Design of drawings
   1. Cross-sectional diagrams are difficult to read; when preparing them,
      indicate from what part of the entire object the cross-section was taken.
   2. The use of directional arrows and clearly defined "Start" and "End"
      points, greatly aid the reading of process diagrams.
C. Color
   1. Objectives of color usage
      a. Color is employed in a graphic to keep the eye on the points of
         interest.
      b. Color may be used to show similarities and differences among graphic
         objects.
      c. Color may be used to give an effect of distance.
      d. Color is used "functionally" to serve as a basis for codes and to
         provide visual contrast.
      e. The use of primary, arresting colors is contra-indicated unless it
         is desired to highlight a specific idea or object.
   2. Principles of color usage
      a. When employing color codes effort should be made to give the correct,
         familiar, or conventional color to the parts.
      b. When using a cold background color, the use of a warm light color
         will create a pleasant harmony.
      c. When using a warm background color, cold, light colors will provide
         pleasing contrast.
      d. A minimum of 3 or 4 background colors will produce minimum confusion
         and still give good color contrast.
      e. Lettering should not contain more than 3 colors.

    f. Shadings from white through gray to black can suggest differences in hue, intensity, and illumination.

    g. The use of cool, receding colors such as blue, green, and violet for background gives an effect of distance whereas advancing colors such as red, orange, and yellow tend to bring depicted elements into the foreground.

    h. Yellow, orange, and green, in that order, on a dark or black background have the greatest carrying power.

    i. Red, orange, and green, in that order, on a white background have the greatest carrying power.

    j. Brilliant colors are best used on small areas and not on large ones.

    k. When preparing original artwork for photographic reproduction in color, the following Color-Aid papers give the clearest color renditions: Y; YT 1; ORO; OT 1; RO; RT 2; RS 1; GYG; YGT 1; BGBT 1; BGT 2; B; RV; VT 1. If possible use contrasting colors together.

  l. When preparing graphic training aids for presentation by television, light figures on dark backgrounds give best visibility.

D. Captions, titles, and lettering

  1. Uses of captions, titles, and lettering

    a. An explanatory statement is a necessary part of a graphic presentation if pertinent facts are to be integrated by the viewer.

    b. Title and subtitles attract reader attention and cause him to read further.

    c. Effective lead text establishes a definite connection with the visual pattern around it and assists the picture story.

    d. Running text in picture stories should be brief but should supply the information not contained in either picture or caption.

    e. Captions of graphic training aids may be explanatory, descriptive, or informative but they must serve a teaching function.

    f. In non-technical presentations, effective captions relate the graphic to the particular teaching purpose.

    g. In technical presentations effective captions identify parts and explain action.

    h. Legible and pleasing type makes for good film strips.

  2. Principles of design of captions, titles, and lettering

    a. In extensive captioning, print caption beside or upon the appropriate part.

    b. If space does not allow this, place labels elsewhere on the graphic and put arrows leading to the appropriate part.

    c. It is a poor method to key or number parts to captions printed elsewhere on the graphic.

    d. The fewer captions the better; only 10 to 20 words can be read by the viewers without losing the speaker's verbal report.

    e. In elementary graphics captions should emphasize terminology specifically applicable to the subject matter.

    f. When two views of the same object are presented, one may be shown with captions and one without.

    g. The caption should be recognizable from the same distance intended for the entire graphic.

    h. The table below presents letter characteristics in terms of letter height and stroke width appropriate for various viewing distances; the table holds only for Gothic letters printed black on a white background.

Greatest Distance to Be Viewed (ft.)	Height (in.)	Optimum Weight (width) of line which forms letter (in.)	Height (in.)	Minimum Weight (width) of line which forms letter(in)
3	1/8	1/32	3/32	1/64
8	5/16	1/16	3/16	1/32
15	1/2	3/32	3/8	1/16
25	3/4	1/8	1/2	3/32
50	1 1/4	3/16	7/8	5/32
100	2	5/16	1 1/2	1/4

i. In preparing lettering on a $6\frac{1}{4}$" x $8\frac{1}{4}$" original for reproduction on
    a slide the following type faces are recommended (the numbers in
    italics are the corresponding Leroy Lettering Pen sizes): Main
    heading, 48 point caps (5); Subheads, 30 point upper and lower
    case (4); Labels 18 point upper and lower case (3); Minimum type
    size 18 point upper and lower case (3). These figures are for
    Bernhard Gothic Heavy type.
j. When making wall charts the following minimum letter heights are
    recommended for Gothic letters. These figures hold for viewers
    with 20/40 visual acuity or better.

Distance to Furthest Viewer (in feet)	Minimum Letter Height (in inches)
100	3.5
80	2.7
60	2.1
40	1.4
20	0.7
10	0.35

k. Use thick letter strokes for all graphic lettering or printing.
l. Lettering, spaced optically, is more effective than that spaced
    mechanically.
m. Spacing between letters should be equal; letters, like D, P, and
    R, should have the white space dividing them equal to the white
    space within them.
n. When making black and white slides make the pictorial subject
    matter a 50% gray; this allows the use of black and white lettering.
o. Original artwork measuring 10 x 7 inches, which will be made into
    slides, should have lettering preferably 3/16 of an inch high,
    1/8 inch minimum.
p. On the 10 by 7 inch artwork originals which will be made into slides,
    55 spaces should be left for a legible line of print, extending the
    full width of the graphic.
q. More than 60 characters and spaces on a line in artwork for slides
    are too difficult to read.
r. In crowded slides, the title may be eliminated since it is usually
    furnished by the spoken context.
s. In preparing graphics for presentation by television the height of
    lettering should be the over-all height of the depicted material
    divided by 15.

      t. In preparing graphics for presentation by television stroke width should be the width of the depicted material divided by 100; the space between letters or numbers should·be one stroke width.

E. Displays of quantitative information
1. Usage and application, general
    a. Pictorial graphs are more easily understood than other conventional graphs and have popular appeal.
    b. Bar graphs and line graphs are more difficult to understand than pictorial graphs but are generally suitable for making comparisons.
2. Usage and application, specific
    a. Pictorial graphs are employed to compare simple quantities.
    b. Bar graphs show only general relationships but are better able to indicate changes in direction of trends than are pictorial graphs.
    c. Use bar graphs for several comparisons.
    d. Line graphs are used to show relative increase, decrease, and fluctuations where accurate reading of many values is required.
    e. "Pie" graphs are hard to read and are not recommended.
    f. Tables are effective when large bodies of specific numerical data must be presented.

F. Design of quantitative graphs
1. The baseline of a bar graph should be zero.
2. Filling in the line graph with a drawing or photograph "silhouettes" the story against the background and is more effective than a plain line graph.

G. Graphic size
Graphic training aids should be large enough to be clearly visible by the entire group. The table below gives recommended sizes for various viewing distances. The table takes into consideration the size of detail on the graphic.

Maximum Viewing Distance (feet)	Stock Sizes Recommended (inches)		
	Small Detail	Average Material	No Small Detail
10	22 x 28	20 x 24	17 x 22
25	24 x 44	22 x 28	20 x 24
45	36 x 48	28 x 44	22 x 28
75	40 x 60	30 x 40	28 x 44
150	60 x 80	48 x 72	40 x 60

H. Use of line in graphic training aids
1. Usage, general
    a. Line should be employed to keep the eye on the center of interest.
    b. Line is used to present shape, dimensionality, and organization.
    c. Line may be used to lead the eye of the viewer from one point on a graphic to another.
    d. Contrasting lines will attract attention; too many contrasts will be confusing.
2. Usage, Specific
    a. In order to present three dimensionality on a two-dimensional graphic, use converging lines, overlapping lines, and shading lines.

b. Locate important objects on a graphic where two or more leading lines intersect.
c. For various viewing distances the following line widths are recommended for visibility:

Distance to be Viewed (feet)	Weight of Average Line (inches)
4	1/32
8	1/16
15	3/32
25	1/8
50	3/16

d. Exaggeration of differences may be obtained by using silhouette lengths or special perspectives for comparison purposes.

I. Graphic symbols
  1. Arrows indicating movement, circles indicating enlargement, and serrated edges indicating cutaways are some of the easily interpreted graphic symbols.
  2. Straight lines and dashes are somewhat difficult to interpret.
  3. Pictorial symbols should be highly simplified, easily recognized silhouettes of the object, usually solid blacks on white.

J. Making graphically depicted material meaningful
  1. Graphically depicted objects should be drawn to scale.
  2. To depict motion, show probable changes in position or pose the subject in a position obtainable only during motion.
  3. To depict the size of an object, show it in conjunction with a linear scale or with a familiar object the size of which is known to the viewer.
  4. To depict depth and distance use perspective lines and/or show loss of resolution.
  5. To depict tactility, show texture, grain, polish, density, sharpness.

K. Composition and layout of graphic training aids
  1. Good graphic training aids are said to possess the following, difficult to define, artistic qualities: balance, unity, harmony, emphasis, rhythm, color, lettering.
  2. Symmetrically balanced designs which consider dark and light areas, and use a wide margin are generally effective.
  3. Use overlaps, repetitions, and groupings of objects to show relationships.
  4. Use I, L, or Z layouts, to induce the viewer's eye to move in a set pattern over the graphic.
  5. Avoid layouts that direct the eye outside the graphic.
  6. Straightforward presentation of facts is as effective in producing learning as graphics with special attention-gaining devices.
  7. Layouts should contain only necessary information.
  8. Layouts should proceed from top to bottom and from left to right.
  9. All slides should be made with the long side horizontal.
  10. When preparing graphic training aids for presentation by television
    a. The principal parts should be organized from left to right.
    b. Three horizontal planes of organization give best visibility.
    c. Radial organization gives good visibility.
    d. Avoid circular, oval, and vertical organization.

  e. The figure should cover 2/3 of the background for greater visibi-
    lity.
  f. Over-all dimensions should have a height to width ratio of 3 to
    4 or 4 to 4.
L. Classification of graphic training aids
  Exton classifies aids into self-teaching ones and classroom ones.
Classroom aids may be of all types and levels of difficulty, and may be
used independently, serially, or in parallel for purposes of comparing one
with another.
  Self-teaching aids may employ attention-gaining devices and must be graded
according to level of difficulty, and used accordingly. The elementary ones
are usually drawings or cartoons and serve as reminders. Intermediate and
advanced aids present more technical material up to the level of a reference
chart. These require previous knowledge on the part of the viewer, and
usually consist of diagrams, captions, and explanatory text.
M. Appropriateness of quantitative graphs for viewers differing in age and
  intelligence
  1. General
    a. For lower intelligence viewers the difficulty in reading graphs is
     due to their lack of familiarity with the graphic vocabulary.
    b. The ability to grasp ordinal numbers develops earlier than the
     ability to grasp cardinal numbers.
    c. Slow fourth grade students do not understand graphs.
    d. Above the fourth grade level simple graphs can be understood.
    e. The ability to read graphs increases from grades 7 to 12.
  2. Specific
    a. Pictorial graphs are the easiest graphs to read and may be used at
     all grade levels.
    b. Bar graphs are easier to read than line or sector graphs but are
     more difficult than pictorial graphs; they are not recommended for
     viewers below the second grade level.
    c. Line graphs are harder to read than pictorial or bar graphs and are
     not recommended for viewers below the third grade level.
    d. Sector "pie" graphs are not recommended for viewers below the second
     grade level.
N. Appropriateness of other graphic forms for viewers differing in age and
  intelligence
  1. The ability to read cartoons increases from age 12 to 15 years.
  2. Interpreting graphic keys is beyond the ability of students below
    grade 6.
  3. With an increase in age and experience there is an increase in the
    ability to comprehend conventionalized diagrammatic symbols such as
    arrows, circles, and serrated edges.
  4. Cross-section diagrams are difficult to read, even at the eighth
    grade level.
  5. The ability to read process diagrams increases with age.
  6. Graphic illustrations help intelligent and educated readers to remember
    written texts; they do not help the less intelligent and less educated
    readers.
  7. Filmstrips are considered good when they suit the grade level for which
    they are intended in regard to vocabulary, illustration, and content.

EVALUATION

In general, the majority of sources reviewed are documented secondary texts, written by acknowledged experts in the field of audio-visual education. The remainder of the reviewed sources are research studies of varying experimental rigor. In general the reviewed material appears representative of the status of knowledge in the field of audio-visual education pertinent to the design of visual aids.

As a whole, the abstracted findings, principles, and conclusions found in the annotations and summary contain considerable amounts of potentially applicable information to the problem of training aids design. However, in several instances such information is either contradictory or inadequately defined. Typical of such inconclusive findings are those by Weaver and Bollinger and General Electric in regard to the size of chart lettering to be viewed at various distances.

In another instance there appears to be inadequate definition of the conditions under which photographs or drawings should be used in preference to symbolic diagrams.

Likewise few concrete criteria seem to be available in regard to the layout and composition of training aids beyond keeping them simple and in keeping with ambiguously defined artistic standards. And finally, with the exception of some data on quantitative charts, cross-sections, and process diagrams, there appears to be little information in regard to the intelligibility to students of varying characteristics of various graphic forms, symbols, and modes of representation.

It is apparent that such inconsistencies and inconclusiveness of results as have been cited above will require some amount of further study prior to their general application to the design of visual aids. However, since these and other findings have been applied with some degree of reported success, they deserve tentative acceptance pending experimental evaluation of their validity.

<u>SUMMARY OF FINDINGS FROM THE AREAS OF ADVERTISING</u>
<u>RELEVANT TO THE DESIGN OF GRAPHIC TRAINING AIDS</u>

The following is a summary of the more definitive findings and conclusions from the reviewed literature on visual aspects of advertising.

A. Color
 1. Color improves the memory value of a particular feature of importance. It should be remembered, however, that this may lead to some reduction in memory value of other uncolored features.
 2. Color temporarily raises the immediate attention value of a visual display.
 3. Visually presented items depicted in red or green have greater memory value than those depicted in blue or yellow. The rank order of their relative effectiveness from best to poorest is red, green, yellow, and blue.
 4. The presence of color in an advertisement tends to raise the attention-value of the advertisement as a whole.
 5. For the memory of special features, the mere presence or absence of color in an advertisement is far less significant than where it is used, i.e., there are differential results when color is used in various features of an advertisement, trade-name, illustrative picture, etc.
 6. When four classifications of advertisements were compared with regard to the relative effectiveness of using color, as determined by recall, the rank order of the 4 groups was article colored, trade-name colored, trade-name uncolored, and background colored.
 7. The most important function of color in general magazine display is the realism which it gives to advertisements.
 8. When looking at a group of mixed colored and uncolored charts, people are more interested in the colored ones.
 9. Color results in greater interest and effectiveness.
 10. Appropriate colors for lettering and background of lettering insure maximal contrast and legibility.
 11. The relative legibility of different colors, from best to poorest, are black on yellow, green on white, red on white, blue on white, white on black, black on white, yellow on black, white on red, white on green, white on black.
 12. Colors have certain characteristics which further the impression value of the poster's own graphic meaning, e.g., blue - tranquility, red - violent and arresting, yellow - gaiety and delicacy, green - restful, orange - vigorous, violent - negative.
 13. The appropriateness of color combinations subjectively determined by consensus, should be used to rule out individual differences in selecting appropriate combinations.
B. Illustrations
 1. Attention is increased when pictures of people are used in visual displays in preference to pictures of objects.
 2. The pictures of people in advertising displays are most effective when they are functionally related to the accompanying text.
 3. Illustrations relevant to accompanying text increase the recall of the verbal message.

4. Illustrations within a group which are relatively larger than others have greater attention value than smaller ones.
5. Objects of particular significance should be conspicuously and centrally-located in the illustrations.
6. Important features discussed in the text should be selectively highlighted in accompanying illustrations.
7. Headlines, subheads, etc., must accompany relevant illustrations in order to maximize viewer attention and to emphasize significance of the presentation.
8. Captions, subheads, etc., give meaning to illustrations.

C. Layout
1. The use of up to 70% white space increases the memory value of homogeneous verbal material.
2. Within limits, absolute size of a visual display makes no difference in attention or memory as long as its content is visible to the viewers.
3. There is evidence that the right-hand side of the page in page arrangements has a slight advantage in attention and memory value.
4. Complex layouts tend to increase viewer attention. However, such layouts require repeated presentation or extended viewing for comprehension.
5. The use of borders as frames in visual displays increases attention and memory value of the display content.
6. Changes in the typography of a trade-name has little, if any, effect on the association of the product with that name.
7. The attention holding power of advertisements is decreased by cartoons in close spatial proximity.
8. Advertising layouts are said to be in balance when the masses of type or cuts appear to be in equilibrium about a vertical line in the spatial center of the display.
9. Good, straight, sans-serif lettering, of a little better than average weight or thickness, is best for poster copy. Staggered lettering or lettering at an angle is not suitable for posters. Straight horizontal lettering is best. Currently there is a trend toward greater use of lower-case lettering, which is more easily read.

D. Motivational factors and verbal content
1. Short titles, between 5 and 11 words or 3 "thought units", are best remembered.
2. Titles that appeal to the reader's self-interest are most effective.
3. Labels and captions are easier to remember when they are relevant to other content of the display.
4. Regardless of the high level of intelligence of a large proportion of the population, the most easily read advertisements are likely to be written nearer the grade-school level of difficulty.
5. Copy which appeals to the psychological needs and wants of the intended audience are most effective.
6. Simple, logical copy with human interest has greatest effectiveness.
7. Humorous copy frequently has been found insulting by the intended audience.
8. Emotional appeals must be used carefully in order to avoid sounding affected and artificial.
9. Believable examples must be used so as not to strain the credulity of the reader.

10. The present tense, second person is best for human interest appeal.
11. Whenever possible, arouse curiosity in presenting the subject.
12. In ads where large bodies of text are presented, use conversational prose with plenty of repetition.
13. Illustrations that depict emotion must be clearly labelled in order to avoid confusion.
14. "Attracting" and "holding" power of visual displays can be scaled with considerable accuracy by experienced judges.
15. In order to insure retention of the content of the ad, there must be some verbal material in addition to the illustration.
16. In a series of related graphic aids, novel material, ideas, etc. should be presented at various intervals to maintain interest.
17. The introduction of travel and human interest ideas in visual displays tend to increase appeal.
18. Though negative appeals in advertising are on the increase, there is no inherent advantage favoring positive appeals as compared with negative appeals in advertising those products which are now using both types.
19. The appeals that are made to basic emotional drives have greatest effectiveness.
20. Descriptive material should be woven into a framework of appeals to basic wants.
21. The most efficient advertisements, other things being equal, are those that arouse a "want" for the commodity.

E. Utilization
1. The repeated presentation of visual displays tends to enhance the memory value of its content.
2. Repeated presentation soon after the original presentation is more effective than delayed repetition.
3. Visual displays which are related or in series must be dissimilar enough in specific content to avoid confusion but similar enough in general design to insure recognition as variations.
4. Auditory commentaries presented in conjunction with the visual displays tend to increase attention and memory.
5. "Read" and "Look" directions orally given do not have any appreciable differential effect upon the attention value of illustrations or texts in full page magazine advertisements.

EVALUATION

In general, the reviewed literature has dealt with visual displays as they are found in magazines, newspapers, and billboards. The majority of the sources were based on field and laboratory research. The remainder were based on opinion, existing advertising practices, and conjecture. Within the limits specified by the reported experimental conditions and/or the frames of reference stated by the authors, the specific findings and conclusions appear to have merit and validity. However, many of the sources varied in their specific problems, media, experimental designs, etc., and hence their generality is restricted to certain types of visual displays in rather restricted situations.

In most instances the literature is consistent in regarding color in visual displays as a determinant of viewer interest, pictorial realism, and attention value. Likewise there appears to be agreement that illustrative material when used in visual advertising must depict humans and human action as functionally relevant to the verbal message of the display. In addition, there is agreement among several authors that captioning and verbal content of visual displays when properly developed are extremely important aspects of conveying the message. Such aspects of layout as size, isolation, white space, and typography are considered important in creating effective visual displays. It is difficult, nevertheless, to generalize the items mentioned or to suggest specific rules. Finally, there is almost unanimous agreement that effective visual displays must tap the viewer's motivations and capitalize on his visual and memory capacities.

In some cases, the reported findings of research on visual advertising seem to "prove the obvious" in regard to prevalent advertising practice. Such instances strongly reinforce the notion that advertising practices are a rich source of experimentally verifiable hypotheses pertaining to the design of visual displays. In addition, such instances of "proving the obvious" now permit the isolation of "common-sense" notions which have the support of experimental evidence and permits the removal of conjecture and contrary opinion so frequently leveled at such notions.

In general, the present review indicates that visual advertising is pre-occupied with the problem of gaining the viewer's attention when competition is relatively high. The visual training aid, on the other hand, is usually found in situations where the audience is in a relatively captive state. The difference between the two situations implies a differential stress on attention getting devices in displays. Since the experimental literature in advertising indicates some controversial evidence on the relationship between attention value and memory value in visual displays, it would seem appropriate that principles of display design pertaining to attention value be cautiously applied to visual training aids. On the other hand, principles of display design pertaining to retention value can be, perhaps, more liberally applied to training displays since the data in this regard are less controversial and have considerable face validity.

In summation, it can be concluded that the findings from visual advertising have considerable generalizability to training aid design. However, the extent of such generalization of design principles is dependent on future experimental verification.

<u>SUMMARY OF FINDINGS FROM THE AREAS OF ENGINEERING DRAWING AND</u>
<u>QUANTITATIVE GRAPHICS RELEVANT TO THE DESIGN</u>
<u>OF</u>
<u>GRAPHIC TRAINING AIDS</u>

      The following is a summary of the more definitive findings and conclusions
from the reviewed literature on engineering drawings and the graphic presentation
of quantitative information.

A. Presentation of quantitative information
    1. Pictorial statistics
        a. Symbol characteristics
            (1) Symbols are highly simplified silhouette designs of the objects
                they represent.
            (2) Symbols eliminate all unnecessary details and should be equally
                recognizable in large or small size.
            (3) Photographs generally make poor symbols.
            (4) Use more or less symbols rather than larger or smaller symbols
                to communicate quantity.
        b. Symbol arrangement
            (1) Three rows of symbols are sufficient to show continuous increase
                or decrease.
            (2) There should never be more than 6 rows of symbols
            (3) If the symbols are wide, do not use more than 10-12 symbols
                per row.
            (4) If the symbols are narrow, do not use more than 25-30 symbols
                per row.
            (5) Within a row, arrange the symbols in blocks of five.
            (6) Where symbols are arranged to the right and left of an axis, an
                explanatory picture placed above the symbols may make the differ-
                ent components clear.
            (7) The symbol explanation should appear under the last row of
                symbols, in line with the symbol furthest left.
            (8) Do not reproduce the symbol itself in the symbol explanation.
    2. Bar graphs
        a. If only a few columns are used, the chart should be higher than it
            is wide and the columns should be narrower than the white space
            between them.
        b. If several columns are used, the chart should be wider than high and
            the columns should be wider than the white space between them.
    3. When using a sector graph ("pie" chart) the first sector should start
       at 12 o'clock and run clockwise.
    4. Line graphs
        a. Use a zero line; if it could not normally appear, indicate it by a
            "break" in the graph.
        b. The curve line should be sharply distinguised from the coordinate line.
        c. Do not use more coordinate lines than necessary to guide the eye.
B. Titles, captions, and lettering
    1. Titles
        a. A graphic must have a title
        b. The title must be clear, concise, and as complete as possible.
        c. Subtitles are used to insure the clarity of the title in those
            instances where a title would be too long.

       d. Subtitles should be placed beneath the title and should have lettering 1/2 to 3/4 the size of the title lettering.

       e. A title should not refer to facts which the graphic does not contain.

  2. Captions and lettering

       a. All captions should be horizontal, never vertical, with either the bottom or the right-hand edge of the page as the base.

       b. If a label or caption cannot be fitted within its appropriate part, it should be placed horizontally outside of it and an arrow drawn to the part.

C. The graphic depiction of relationship

  1. In presenting numerical material in tabular form, use wide lines to show supraordinate-subordinate relationships and narrow lines to show coordinate relationships.

  2. Brackets and arrows are effective symbols to indicate groupings or movement.

  3. The depiction of a hierarchy by a circular arrangement is not recommended.

  4. Where relationships are shown by connecting lines do not present too many lines.

  5. Cross-hatchings, shadings, color, and distinctive shapes are used to show relationship.

D. Line

  1. The shape of objects is generally depicted best by contour lines.

       a. A perspective line drawing gives the most pleasing pictorial effect and is generally most useful for depicting shape.

       b. When depicting detail on three mutually adjacent sides of an object an isometric line drawing should be used.

       c. An isometric view is good for showing cross-sections and cutaways.

       d. When only two sides of an object need to be shown and there is an irregular feature on one of them, use an oblique drawing.

       e. Place that side of the object with the irregular feature parallel to the picture plane.

       f. Place the longest dimension of the object parallel to the picture plane. In conflict situations, (e) takes precedence over (f).

       g. A line which is thickened as it flows behind another plane seems to recede and create an effect of depth.

       h. A line may "break" as it flows behind another plane, indicated depth.

       i. Thickening line elements on a shadow side of an object dramatizes shape.

  2. Where only one side of an object is shown, or when there is a double-curved surface, depth may be indicated by line shading or rendering. Line shading is done by parallel ruled lines according to the principle than an inclined illuminated surface is lightest nearest the eye, and an inclined surface in shade is darkest nearest the eye.

  3. When necessary to show the interior of an object or the assembly of several different pieces use a cutaway or cross-section.

       a. Always indicate cut material by section-lining or cross-hatching. This done with uniformly spaced fine lines at 45° to the horizontal.

       b. Over-shaded graphics are hard to read.

       c. The cutting plane may be offset and does not have to be continuous.

       d. Cylindrical objects in the cutting plane should not be sectioned but rendered.

       e. Adjacent pieces should be section-lined in opposite directions.

     f. Section-lining for the same piece in different views should be identical.

     g. A phantom view is used to accentuate a new part of a well-known item, particularly an internal part.

E. Codes and symbols

   1. When indicating the location or composition of standard objects, standard symbols may be used. Lists of standard symbols may be obtained from the American Standards Association, 29 West 39th Street, New York, N.Y.

   2. Distinguishable symbols and standard, well-differentiated color codes facilitate initial graphic discriminability.

   3. When color coding is used, the color should be applied in flat values.

   4. A black background emphasizes color.

EVALUATION

In general, the reviewed material on quantitative graphic presentation is drawn from the work of two acknowledged experts in the field. Though little experimental evidence is available as to the reliability and validity of the principles they present, these authors must be assumed to have been somewhat successful in the commercial application of quantitative graphic presentation. It would therefore seem reasonable to accept their statements and suggestions concerning the design of visual displays, as highly simplified rules-of-thumb or guides in the absence of more definitive information.

Likewise the information from engineering drawing, though lacking in experimental verification, has a long and successful history of commercial application and practice. Even though principles and techniques of engineering drawing are very effectively used by highly trained viewers, they are of questionable comprehensibility to naive and untrained individuals. Nevertheless, this discipline has such specific and concrete specifications pertinent to the design of visual displays that it seems appropriate to accept provisionally its recommendations and to apply them to the design of graphic training aids.

It should be noted that principles of design from engineering drawings, and to a lesser extent principles from the area of quantitative graphic presentation, are formulated to permit readily programmed experiments to validate their applicability to graphic training aids. In this regard, it appears that the major question requiring an immediate experimentally determined answer is, "What is the comprehension, by typical students, of visual aids which have been prepared according to specifications of engineering drawing and quantitative graphic presentation?"

SUMMARY OF FINDINGS ABOUT UTILIZATION OF GRAPHIC TRAINING AIDS

Results pertaining to the effective use of graphic training aids are summarized under the headings of aid selection, instructor preparation, audience preparation, aid presentation, audience participation, and follow-up techniques. No rating of importance is implied in their order of presentation.

A. Graphic training aids are generally selected:
   1. From suitable annotated catalogues, bibliographies, etc.
   2. To fill a specific instructional need.
   3. To contribute to the understanding of the subject.
   4. To present a logical sequence of information.
   5. Which contain a high degree of technical quality
   6. Which contain accurate and unbiased information.
   7. To be relevant to the subject matter being taught (this is especially true for cartoon graphics).
   8. To be appropriate to the learning situation.
   9. To supplement by illustrating, and not repeating, specific points of the instructor's presentation.
   10. To be suitable and appropriate in vocabulary level and approach to the intellectual level and previous experience of the class.
   11. For audiences of different abilities.
       a. For an audience with a narrow range of ability, a single aid which is slightly below the average intelligence is used; with a heterogeneous group, a variety of aids is used.
       b. For dull students, aids which contain considerable detail, simple vocabulary and sentence structure, and slow rate of development are used.
B. Instructors prepare for classroom presentation of graphic training aids by:
   1. Previewing the aid.
   2. Deciding how to use the aid, e.g., to stimulate student interest, to clarify and expand subject matter presented by other methods, to review, to plan future lessons based on student reaction, etc.
   3. Planning for "before and after" aid presentation activities and determining what students should be told to look for in viewing the aid.
C. The audience is prepared for the presentation of graphic training aids by:
   1. Being given an oral preview of the content of the aid.
   2. Being given additional background on the content of the aid.
   3. Being shown how the content of the aid relates to their previous experience and interests.
   4. Being shown how the content of the aid relates to the subject matter being taught.
   5. Being asked specific questions pertaining to the content of the aid.
   6. Being instructed about the important features of the aid and what should be learned from it.
   7. Being instructed to "get a mental picture" of the content of the aids, to "imagine doing" that which is depicted, to rate how "your muscles feel" were you to do what the aid depicts, and "make up words and phrases" which describe the content of the aid.

D. During the classroom presentation of graphic training aids:
   1. The aids are presented under conditions of minimal distraction and optimal physical conditions of lighting, ventilation, noise level, and seating arrangements.
   2. All equipment is used in an unobtrusive manner.
   3. The instructor stands aside from the aid and refers to it or its content with a pointer of contrasting color to the background of the display.
   4. The class time allotted for the presentation of aids includes time for student questions and discussion of the aid.
   5. When the content of the aid is new to the class, the instructor's presentation of its content is as slow as it can be without losing the attention of the audience.
   6. Significant and novel content or technical vocabulary in the aid is brought to the attention of the student, commented upon, and stressed in presentation.
   7. The following features of depicted objects are stressed by the instructor: motion, size, color, taste, weight, odor; scales, abstract figures, and symbols (e.g., maps) are also emphasized.
   8. The instructor names, wherever possible, all the elements depicted in the aid.
   9. The instructor uses the imperative form of address and commentary which alerts and orients the student.
   10. Questions directed to the students and summary statements of the content of the aid are used by the instructor before, during, and following aid presentation.
   11. Repeated showings of visual aids are used to enhance the amount learned from the aid, as do reviews prior to, and after, examinations on the content of the aid and also actual practice with the depicted materials.
   12. The instructor integrates other types of training aids, as well as other types of instructional methods, with graphic aid presentation.
   13. Training sessions with visual aids (films) may last as long as one hour with no significant decrease in learning or viewer interest. However, slow learners may be adversely affected by long sessions; the learning material presented last is more adversely affected.
E. Active participation by students in learning from graphic aids is induced by:
   1. Giving student an advance assignment on the content of the aid.
   2. Announcing that an examination on its content will follow the presentation of the aid.
   3. Systematically giving examinations at the completion of aid presentations.
   4. Encouraging students to ask questions and to discuss the content of the aids.
   5. Giving students a study guide and/or having students fill in an outline or true-false check-list on the content of the aid.
   6. Having the instructor relate aid content to the experiences of the students.
   7. Having students practice the content of the aid while reviewing it.
   8. Having the instructor give knowledge of results of questions asked of students pertaining to aid content.
   9. It should be noted that the techniques intended to increase audience participation are appropriately applied when some initial learning has taken place, when the task is not too complex, when the speed of development of the aid is not too rapid to interfere with practice, when guidance can be given, when students are least motivated to learn, and when the level of intelligence is low.

F. Following the classroom presentation of graphic training aids:
    1. The instructor reintroduces the problem or topic to which the aid is relevant and reviews the content of the aid.
    2. Such reviews or follow-ups of aid presentation are usually done as soon after the aid presentation as possible.
    3. The review of aids includes summary discussions and statements by the instructors, questions and discussion between the instructor and students, examinations on the aid content, and student viewing of other pertinent aids or reviewing of original aid.
    4. The instructor uses such student responses as questions, discussion, comments, test results, etc. as a measure of the level of learning from the instruction and graphic aid. Such measures are also used as a measure of the adequacy of the instruction and aid.

EVALUATION

The literature covered here has been drawn primarily from three sources: reference works in audio-visual education, educational journals, and government research reports.

In general the reviewed material was originally written for instructors or teachers; the rest of the material was general in nature and cited little experimental evidence. Professional educators show highly consistent agreement as to the importance of principles of effective instructor utilization of visual aids. The majority of research on instructor utilization of visual aids has been concerned with films and not with static visual aids. The research studies vary considerably in regard to subject matter of aid content, (e.g., phonetic alphabet to slide rule scales), characteristics of the experimental subjects (e.g., college to grade school level), experimental designs (e.g., single variable to factorial designs), and experimental measures (e.g., paper and pencil to performance tests).

Despite the heterogeneity of the reviewed sources and the variation among the experimental studies, there appears to be considerable agreement that effective instructor utilization of visual aids involves appropriate aid selection, class preparation, class presentation, and class review. In addition, though some differences of opinion and experimental findings exist, there is general agreement that various procedures for inducing viewer motivation and participation are necessary in the effective use of visual aids.

The present reviewers have concluded that the findings of the literature have sufficient face validity to merit application to instructor utilization of static graphic training aids, pending the experimental verification of the benefit of such applications.

CONSTRUCT FOR SOCIAL ACTION

Social Action

As we study Social Action programs we see they follow a certain pattern down through the action stages. Of course the needed application must be made for each situation.

To understand Social Action, we must be able to see the component parts of the over-all social system as it operates that is prior to action initiation.

To start a program if the wrong steps to set up is inefficency may lead to failure and inefficiency.

The following items or phases make up Social Action in a general Social Program:

1. The Social System
   a. All Social Action takes place somewhere within a social system.
   b. We must have a general understanding of the social system we know what parts are important or has the one social system concern.

2. The Prior Social Situation
   a. For every given social action there must be a relevant experience in the social system that relates to the action of Social Action now under consideration. We should distinguish the actual existing experience or prior social occurrences to the proposed Social Action program.

3. Problem about the situation within the social system
   a. Social Action usually has its start or may start by agreeing that some kind of problem or situation exists that something should be done.

   b. Which may be started by people within a social system or someone with inside-outside functions of a outside.

   c. Interests for initiating a project or a group (example: have a soil testing facilities) or a community interest group to test soil on situation which should result in how to use soil fertilizer).

4. The Initiating Sets
   a. There must be sufficient agreement to do something within people than the Social Action organizations. Understand who feel something should be done about the actions are Initiating Sets.

   b. The initiating set consists of two or more people usually not more than four or five people.

   c. More than one initiating set may be necessary when many alternatives and actually originate working on the idea program.

1. The Legitimation Stage
   a. In almost every community, of social system, there are certain people or groups that seem to have the major authority and prerogative to pass on things, to make them legitimate ideas. These people are called "legitimizers". They put a stamp of approval upon the idea.

   b. The initiating and usually guide the project to the legitimizers. To by-pass this group usually spells failure.

   c. Legitimizers may be –
      (1) Formal administrators offical associations, clubs, etc.
      (2) Informal certain prestigeous or affluent

   d. A legitimizer may hold his position because of money, family, prestige, key position, personal popularity, influence

   e. A legitimizer may be well regarded by some, yet for nothing, you may also be one, don't neglect, etc.

   f. If you propose a legitimizer his position is challenged. At times the legitimizers may actually have to be by-passed, if it is felt the proposal really merits action. This should be done with the consequences in mind.

2. The Diffusion Stage
   a. After an idea has been legitimized, it is ready to be passed on to the diffusion stage.

   b. At the start of this stage only the idea originators, the initiators and the legitimizers have heard of the idea.

   c. At this stage we are ready to determine if the general public or the people who feel the need of such service will define it as a need.

   d. The diffusion stage takes the proposal to the people. In each case careful evaluation should be made before one does this.

   e. Quite often the idea originators make a poor job of diffusion.

3. Definition of Need
   a. Once the diffusion can is accomplished we have to change a problem become the people's problem. A number of techniques that can be used to get large numbers of people to see a problem and identify it to be one of their concern. There are

(1) _____ Resolution – The _____ Long Range Program. To look at the facts to the people.

(2) Program Development Conditions – certain key people in the _____ situations, coming together and in the _____ begin to see a need.

(3) Discussion and Consultation – our concern, can be the continuous concern seen is no _____ of one who cares".

(4) Requesting Contact – When people _____ they certain needs _____ to _____ certain _____.

(5) Determination to Change – _____ to change improvement in _____ _____ need, or _____.

(6) Building on Past Experiences – the _____ _____ let's work well on our _____ _____.

(7) Change the _____ – It might _____ _____ negotiators and _____ _____ _____.

7. Commitment to Action:
   a. Besides getting a definition of need they possibly _____ also get a commitment to do something. They may _____ agreement to attend meetings, _____ or _____ pledge money to make part of program. _____ _____.
   A commitment to action is one of the important steps in the social action process.

9. What We Want To Achieve:
   a. Once a felt need is established, we _____ _____ set some definite targets, goals or objectives. Some of the people must be willing to try. These goals may need to be spelled out in:
      (1) Real criteria for goals;
      (2) Numbers of goals;
      (3) Should behavior changes to _____ _____.

10. Explore Alternative Methods or Means:
    a. Usually we have much trouble agreeing _____ _____ _____ do something than we do on what we _____ _____ _____.

    b. All alternatives or different ways _____ _____ _____ be considered.

    c. After evaluating all alternatives in the _____ _____ alternative and proceed to _____.

11. Set Up the Plan of Action:
    a. After we have set up our goals and objectives and have decided on the best methods or means _____ _____ _____ work we set up a plan to _____ _____ _____ organizational structure to carry it out.

(1) Did we accomplish what we set out to do?
(2) Were the methods good?
(3) Did we make good use of resources?
(4) Why was the program successful?
(5) Or why did it fail?
(6) How would we plan differently if we were to do it over again?
(7) What did we learn?
(8) Where do we go from here?

Leaders group report "C"

(1) Evaluation
    Research
    Reports, Letters
(2) Evaluate process
    Did we get the job done?
    How well did we do it?
    What next?
    Why successful?
    Why failure?
(3) Evaluate at every step.

ADD COLOR TO YOUR EXHIBIT

You can control the whole mood of your exhibit by your choice of colors. Decide whether you want to create dignity, crispness, gaiety, or nostalgia. Then build your color scheme around that atmosphere. You'll want contrasts, but avoid complementary colors which have a tendency to fade together when viewed from a distance.

The six main colors are red, blue, yellow, orange, green, and violet. To help you see their relationship, look at their order on the color wheel. By mixing the colors, you get different hues. For instance, red is a color, while pink, rose, ruby, etc. are the hues of that same color.

Aren't black and white colors, too? No, they are neutrals. Take away all color everywhere, and you get total darkness, black. Total brightness like the white of the sun is real white or white white. The neutral gray lies in between black and white.

Warm Colors or Cool Colors

Red, yellow, and orange are know as warm colors because they give a warm look to things. They add pep, and a warm glow to your exhibit. If used in large amounts, they can make your exhibit look smaller because warm colors seem to advance towards you.

Blues, greens, and violets are known as cool colors and can create that effect in your exhibit. If you have a very small booth, the cool colors will make your exhibit appear larger or more spacious. Used in large amounts in the exhibit, they will create a more restful atmosphere.

The next step is to learn how to use the colors together. When you put colors together in an exhibit, you create a color scheme. It's much easier to plan a good color scheme if you have a guide.

Five Guides to Color Harmonies

First guide: Use of one color -- If you vary it by using some of its tints and shades, one color can be exciting (for instance, light green, medium green and dark green).

Second guide: Neighboring colors are any three colors together on the color wheel (for example, yellow, yellow-green, and green; or blue, blue-violet, and violet). If you use this color scheme, allow for some "play" in your colors -- some light, some dark, some bright, some dull -- to avoid monotony.

Third guide: Complementary colors are any two colors directly across from one another on the color wheel. They are referred to as complementary because one color complements the other; that is, red makes green look greener, green makes red look redder.

IP-10 (1-57)

In lettering, do not use complementary colors such as red letters on a green background. You can use these colors in the color scheme for your exhibit, but you'll have to make one darker and duller for real interest. Cherry red against a dark forest green is an example. Soft yellow and deep violet is another combination, or red-orange against a dull blue-green. Don't use both colors in equal amounts -- you'll want more of the dull color and less of the bright. These particular color schemes look best in a large exhibit space.

Fourth guide: Neutrals plus an accent -- Black, white, gray, or any colors very close to them (like buff, beige, cream, and oyster white), used with one bright color (red for example), will make an interesting, modern color scheme.

Fifth guide: Triads -- Make a triangle and place it on top of your color wheel. Notice the three colors which the triangle points out. Turn it around so it points out three other colors. Each three colors the triangle points out form a "triad." You can use these three colors to make a color scheme, but you'll want to be careful not to overdo things. Make the color for the largest area quite dull, let the next color be slightly brighter, and have the one for the smallest area in the exhibit very bright.

Colors used to attract include red, orange, or yellow. Use them on the "hot spot" of your exhibit or for your main message. They are the most conspicuous colors and make a strong impression.

Use hues, pastels, shades, or neutrals for the background of your exhibit. These colors look well with almost any color mounted on them. A good rule of thumb is : Use vivid colors sparingly and on small areas; use pastel colors on large areas. Refer to your color wheel in selecting the right colors for your exhibit.

The lighting in the display can play some surprising tricks on your colors. Check your colors under a strong light to see if they "wash out." If there is a chance that your exhibit may be under fluorescent lighting, know in advance exactly how your colors behave under those lights.

ADD COLOR TO YOUR EXHIBIT

You can control the whole mood of your exhibit by your choice of colors. Decide whether you want to create dignity, crispness, gaiety, or nostalgia. Then build your color scheme around that atmosphere. You'll want contrasts, but avoid complementary colors which have a tendency to fade together when viewed from a distance.

The six main colors are red, blue, yellow, orange, green, and violet. To help you see their relationship, look at their order on the color wheel. By mixing the colors, you get different hues. For instance, red is a color, while pink, rose, ruby, etc. are the hues of that same color.

Aren't black and white colors, too? No, they are neutrals. Take away all color everywhere, and you get total darkness, black. Total brightness like the white of the sun is real white or white white. The neutral gray lies in between black and white.

Warm Colors or Cool Colors

Red, yellow, and orange are known as warm colors because they give a warm look to things. They add pep, and a warm glow to your exhibit. If used in large amounts, they can make your exhibit look smaller because warm colors seem to advance towards you.

Blues, greens, and violets are known as cool colors and can create that effect in your exhibit. If you have a very small booth, the cool colors will make your exhibit appear larger or more spacious. Used in large amounts in the exhibit, they will create a more restful atmosphere.

The next step is to learn how to use the colors together. When you put colors together in an exhibit, you create a color scheme. It's much easier to plan a good color scheme if you have a guide.

Five Guides to Color Harmonies

First guide: Use of one color -- If you vary it by using some of its tints and shades, one color can be exciting (for instance, light green, medium green and dark green).

Second guide: Neighboring colors are any three colors together on the color wheel (for example, yellow, yellow-green, and green; or blue, blue-violet, and violet). If you use this color scheme, allow for some "play" in your colors -- some light, some dark, some bright, some dull -- to avoid monotony.

Third guide: Complementary colors are any two colors directly across from one another on the color wheel. They are referred to as complementary because one color complements the other; that is, red makes green look greener, green makes red look redder.

In lettering, do not use complementary colors such as red letters on a green background. You can use these colors in the color scheme for your exhibit, but you'll have to make one darker and duller for real interest. Cherry red against a dark forest green is an example. Soft yellow and deep violet is another combination, or red-orange against a dull blue-green. Don't use both colors in equal amounts--you'll want more of the dull color and less of the bright. These particular color schemes look best in a large exhibit space.

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Visual Aids Are Not New!

With the birth of television, we have heard a lot about visual aids—one might even think that they grew up together.

Actually, there is nothing new about visuals. They make use of sight... a basic means of learning. A baby learns by observing long before he can either speak or read. We have evidences of communication through visual media from as far back as the Stone Age. We get them from studying stone carvings that are still in existence. And "seeing is believing"...a proverb known throughout the world!

Why Visualize?

All people see alike. A picture of a cow means something to anyone who is familiar with the animal, although the word itself, either written or spoken, can be understood only by people of the same language.

We have heard the old Chinese proverb, "One picture is worth 10,000 words." Do we have any evidence that this statement even approximates the truth? We do know that the retention of a lecture decreases from about 60 percent at the time of exposure to about 20 percent three weeks later. When visuals have been used, the effectiveness of lectures has been increased four times. The influx of picture magazines in the past few years indicates that illustrating is not only an effective way of presenting information, but a popular one as well.

The reasons for the effectiveness of visualizing can be traced to these characteristics:

1. They hold attention.
2. They create interest.
3. They increase understanding.
4. They increase retention.

A somewhat incidental effect of visualizing has been that it gives the person who presents the material a renewed interest by giving him a new way of presenting it.

TV Is a Visual Medium

We are not concerned with the question of whether to visualize, but rather with the question of how to do it most effectively.

There are several general principles we should keep in mind:

First, the television screen has a proportion of four to three, on the horizontal plane, and visuals should approach that same proportion.

Second, visuals must be kept simple. The viewer is concentrating his attention on a relatively small area—his television screen—and a simple one, two, three presentation is going to be most effective.

Third, we are still concerned mainly with black and white television, so your visual should not be based on color. The camera will pick up colors only as tones of grey.

Fourth, lighting in the TV studio will cause annoying reflections unless dull surfaces are used. Also, black and white used next to each other will cause halo effects that can be disconcerting.

What Visuals to Use

Don't try to invent an artificial visual if you have the opportunity to use the actual object. The real object is usually easier to obtain, looks more authentic than any model or graphic, is familiar to the viewer, and does not detract as would a gadget. If you are talking about pigs, use a live pig... soil, use samples of soil. A dress construction, show the actual dress.

Motion pictures, if obtainable, can be as effective as a live studio presentation. In fact, they can be more effective in cases where the situation cannot be duplicated in the studio. From the standpoint of the viewer, they are no different from a kinescope of a studio presentation. Film clips--short sequences from a movie--are often used. Movies incorporate motion and sound and have the additional benefit of condensing time and space.

Models should be considered when the actual object is either impractical or impossible to bring into the studio. A model is usually thought of as being a reduced scale version of the real thing, but in some cases it might be desirable to show an enlarged version. Models can be taken apart to show interior construction and can be animated to produce desired effects. Such animation should, however, not detract from the message you are trying to get across. Don't overlook toys as a good source of models.

A live graphic is a graphic presentation built up step-by-step in front of the viewer. It conveys the impression that you are building the story especially for him and allows him to follow you more easily.

If you are artistically inclined to have simple facts and figures to present you can use a newsprint pad and a wax pencil, colored chalk, or fountain brush pen.

And don't overlook the old standby, the chalkboard. Notice that we refer to it as a chalkboard, since it is not black. A green board and yellow chalk will not produce the halo effect that results from using white chalk on a blackboard. You can make a simple and inexpensive chalkboard by painting the smooth side of a piece of tempered masonite with green chalkboard paint.

If you don't want to take the time necessary to write or draw your message in front of the viewer, you can use a "strip tease." Cover your points with strips of wrapping paper, and reveal them one by one by peeling off the strips at the appropriate time.

A flannelgraph works on the principle that cutouts backed with a rough material such as flannel, felt, or coarse sandpaper will adhere to the flannel. A piece of cotton flannel stretched tightly over a smooth surface will serve as the base. A dark colored flannel will not show soil easily, and light colored cutouts will show up well on it.

Your cutouts can be magazine illustrations, construction paper silhouettes, or simple line drawings. Cutouts can also be made directly from the newer suede paper or napped rubber sheeting.

A Ferriergraph has a tab built in that permits you to simulate action by having lines, figures, or illustrations pop into view. It is particularly suited to TV because the tab can be pulled "off camera." The cover stock and tab should be made of fairly heavy stock. With dark matte surface there will be less tendency for the camera to pick up the cut-out portions on the cover. A light-colored back cover will show up well through the openings when the tab is pulled.

Perforated hardboards, used extensively for store displays, offer a versatile background panel for TV use. Holes spaced either one-half inch or one inch apart will enable you to use wire hooks, gold tees, or paper fasteners for showing pictures, charts, and posters. A series of fixtures are available for use as shelf brackets, literature holders, garment hooks, easels, etc.

With hinged sections of perforated hardboard in units of 36 by 48 inches you can build up display units of various sizes to fit the occasion.

We speak of a static graphic when we are referring to something prepared beforehand that is shown to the audience. It is usually in the form of a picture, chart, or poster.

Still pictures should be at least 8 by 10 inches and mounted on cards to keep them straight. A matte or semi-matte finish is essential to reduce reflections. They should be horizontal rather than vertical, and care should be taken to be sure they show the desired details. As a rule, closeups will prove most satisfactory.

Slides are being widely used. You can use both black-and-white and colored, but most stations can project only vertical shots. You will also want to check with your station in regard to mounting also, because many stations can use only certain kinds of metal mounts. Remember that a slide is static, and in order to insure movement you will need to maintain a fairly rapid pace....four to six slides a minute.

You can get materials that will enable you to type your message on thin plastic by using carbon paper or write it on frosted acetate with a pencil. By mounting either type in a glass mount, you will have an inexpensive slide that can be quickly produced.

Charts and posters are commonly used on TV. Regardless of the way in which you use them, be sure to keep them simple. One idea per poster and one comparison per chart is desirable. Use large and bold lettering and few words. Center your subject matter well, and use wide enough margins to enable the camera to focus properly. Light grey or buff cards with black lettering are satisfactory.

Use Them Properly

The effectiveness of your TV presentation is going to depend largely on your choice and use of visuals. Pick only those that you need in order to get your points across...there is such a thing as overdoing it.

Insure constant movement throughout the program. A program that is properly visualized should get the message across even if the sound should happen to be turned off.

Think of visual aids as your outline in presenting your show. Select them wisely, arrange them logically, show them properly...and you will have an effective program!

TELEVISION'S TATTLE-TALE GRAY
By
William H. Tomlinson, Producer-Coordinator WKAR-TV
Michigan State College

Let's look at the Kodak Gray Scale. Notice that this scale consists of a series of ten small blocks about an inch-and-a-half square, from left to right, WHITE No. 1 to BLACK No. 10. These are the TEN STEPS OF GRAY. Each block is a little darker gray than its neighbor to the left. A NEUTRAL GRAY would be somewhere between five and six. The last block, No. 10, is a deep black.

Let's consider a few practical examples. Have you ever watched a television show in which lettering appeared on your screen. Perhaps there have been times when you couldn't read the lettering because there was such a bold dark streak across the screen which obscured the message. Or, maybe you have watched a man appear on your screen in a tuxedo. His jacket may have looked a little unusual because of the gray cloud about it. On the other hand, you may have seen a dazzling blonde on the screen, and directly over her head there appeared to be a halo. In each of these cases there was a common problem called CONTRAST. In each instance, there was an improper selection of grays. In the case of the sign, the lettering was perhaps black on white, or white on black. In the second case, the man was wearing a black tuxedo with a white shirt front. In the third case, the blonde may have been standing in front of a dark background. In each case, blacks and whites introduced trouble.

Now, let's look once again at the gray scale. WHITE is No. 1, BLACK is No. 10. No. 1 against No. 10 means that these two shades on the gray scale are separated by TEN steps. This separation is too extreme for the television system. The CONTRAST is too high. The trick, therefore, for good gray rendition is to reduce the number of steps between the shades of gray selected. Through numerous experiments, it has been found that a gray separation of from two to four steps between the foreground and background will usually produce a good gray rendition for television purposes.

So far we have been talking in terms of gray. Does this mean that everything we wear for television should be a shade of GRAY? Not necessarily. Remember, everything the camera sees is interpreted into shades of gray. Which means that the television camera sees color, but electronically translates that color into gray.

Speaking of translation, let's refer to the Kodak Color patches in your yellow packet. Under each color you might mark the following numbers in pencil:

Black	10
3-color	6
White	1
Cyan	3
Violet	5
Magenta	3
Primary red	4
Yellow	2
Green	4

These numbers indicate what step of gray the particular color appears at when translated by our television cameras at Michigan State College under certain specific lighting conditions and under certain specific video operating conditions.

Television has a way of playing tricks with your vision. Have you ever noticed how green lettering on a red background can be very legible when seen by the normal human eye (even though it does tend to vibrate)? However, notice in the scale above that primary red and green are both the same number on the gray scale. This means that this same sign which you can read with your eyes will probably not be readable on television.

"Wait a minute!" you may say. "Does that mean that every green and red card is unusable for television?" Before answering this, let's pose another question. Specifically, what does GREEN mean? How many different shades of a green are there? For example, there are light greens, dark green, Hooker's Green, Spring Green, Emerald Green, James River Green, Plantation Green, Waterloo Green, Pea Green, Blue Spruce, and yes, even Honeydew! Each is different, depending upon its mixture with some other color or with black or white pigment. So you can see that it would be almost impossible to express the corresponding gray value for the color GREEN, unless the color was actually seen on the television system. The colors in the Kodak Color Control patch and their corresponding values were given so that you would have an idea, a general idea, of how these colors would appear on the television system. Referring once again to the kit...this means that if you were to wear a light gray suit (about No. 3 on the gray scale) and were to stand in front of a brown background (such as the 3-color which is equivalent to No. 6 on the gray scale) there would be adequate gray separation and you would appear without halo, clouding, streaking, or any of the other different effects.

Let's summarize. When you are called to do a television show, find out the color environment in which you will appear. Avoid colors that will offer too high a contrast to this environment. In your own personal wardrobe, avoid a shirt of too high contrast with the jacket. How does the tie contrast with the shirt? Avoid a white handkerchief in the upper pocket in a navy blue suit. Remember, the happy middle-of-the-road approach applies to the outfit you will be wearing on television. Don't wear blacks on whites, or whites on black because of the extremity. On the other hand, don't wear everything in the same shade of gray. Get good contrast separation and texture, but don't go overboard.

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Provided for Television Workshop use by
Federal Extension Service, USDA

982 (10-54)

By Joe Tonkin
Division of Extension Information
September 1953

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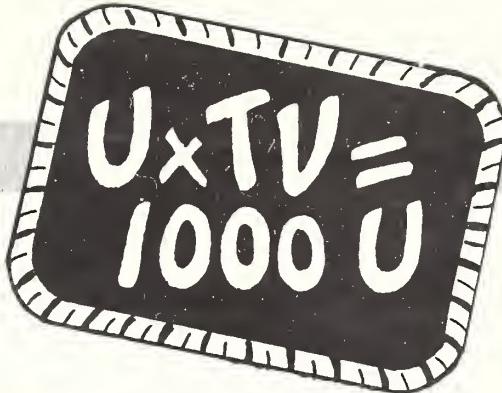
Yes, you times television equals one
thousand of you. Television multiplies your effectiveness as an Extension
worker. Keep the following points in mind when the opportunity to use
television comes your way.

1. IMPACT.

   The impact of television affects us whether we use it or not. Tele-
   vision's straight to the point, lay-it-on-the-line style leads our
   people to expect the same concise information from us. It calls on us
   for better meetings, talks that give information in one, two, three
   fashion, short publications, uncluttered demonstrations, and more ef-
   fective visual aids.

2. WHY USE IT?

   Television is more efficient. It reaches more people with a single
   effort on your part, and at the same time, with no more effort it
   reaches people you have never reached before.

3. CAN I DO IT?

   Sure! Television uses the same abilities that qualified you for your
   Extension job in the first place. That is your ability to talk, to
   show, to explain, and to plan.

4. WHAT CAN I DO WITH IT?

   You can do method demonstrations, which are made to order for the
   television closeup. Keep these demonstrations simple. Don't try to
   cover too much. You can do illustrated reporting, which is a tele-
   vision adaptation of the result demonstration where you use field
   specimens, and visual aids to show the value of a practice. You can
   carry on an interview with a guest, provided you have a field specimen,
   pictures, or other visual aids to form a focal point for your discus-
   sion. Finally, you can use these types of presentation individually
   or in combination to make up the content of your program.

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5. HOW CAN I DO TV?

Your starting point is PREPARATION.   Preparation in Television involves careful and definite planning for the audience you reach plus extreme attention to detail. It is in this care and detail that we invest most of our Television time. Next, we are concerned with the ORGANIZATION of these details.   To do this we make out a RUNDOWN SHEET.   This is not a script to be read, but a plan to be followed. Give it in advance to the director of your program at the station. Go over it with him. Work closely with him.

After preparation and organization, your big job is how to show your material on camera. To do this regard the camera as a person. Show things to it as a good clerk shows you something across the counter in a department store.   Hold it on target long enough for the camera to see it. Move deliberately. Don't jerk. And by all means, avoid clutter or anything that will divert the viewer's attention from where you want it to be.

6. WHAT ABOUT VISUAL AIDS?

The best visual in television is the REAL thing.   Of course it is not always possible to have the real thing, a trench silo for example, in the studio. That is when visual aids literally come to our aid. We use a picture, a film, a drawing, or a model to show our audience how such a silo is constructed and how it is used. Drop cards and words on a flannelgraph serve to give visual emphasis to our recommendations.   Use plain bar charts sparingly. Keep in mind that the message area of a television receiver screen demands that the subject of interest in a picture, slide, or drawing or the words on a card be well in the center with wide margins on all sides. As for color, at this time we are dealing in values of gray. There is no absolute black or absolute white on television. Avoid white and very dark clothes. Use light blues, grays, and (for the ladies) pastel shades. For contrast in cards use flat black letters on gray. Letter size should be large to the extent that about 30 characters would be the limit to the card or slide. Finally, do not forget that all television is transmitted in an aspect ratio of three units high to four units wide. For this reason you can't use slides that require vertical projection.

7. BALANCE YOUR METHODS.

Remember that television is the best substitute for a personal contact. But it is still a substitute. Face-to-face teaching and real-life demonstrations are the most effective approaches to the learning process. Balance your educational work by using all available personal, group, and mass methods. But don't neglect television, because the interested viewing audience is large and constantly growing larger.

BE SOLD ON YOUR SUBJECT.   BE YOURSELF.   TELEVISION IS A NATURAL FOR EXTENSION PEOPLE.

For further help consult Television for You (Agr. Handbook No. 55, U. S. Department of Agriculture, 1953).

Spots

for illustrating
extension circular letters

These drawings were developed with the hope that you may adapt them for use in your circular letters.

To those of you who have had little experience with illustrating circular letters, it may be interesting to know that many of these sketches were suggested by newspaper and magazine advertisements. Perhaps, like many others, you'll want to start a file of ideas and drawings from such sources. You'll be glad you did.

Here are some other tips you may find helpful:

Tones give an illustration weight. Those indicated here by dots and lines may be put in with a screen plate.

It's a good idea to work up the layout of your letter (placement of drawing, lettering, and typing) before stylus work is done on the stencil.

It's also a good idea to vary the position of illustrations in your letters. Top left seems to be a favorite place for a drawing, but it becomes monotonous when used too often. Try a sketch with lettering all across the top, or all across the bottom of a letter. Try having an illustration spilling down the left margin. Or put a drawing at the bottom left. Top right and bottom right are good, too, but in these positions the results will look better if the typing in these areas is justified, and that simply means to leave extra spaces between words to make the ends of lines block up.

Avoid placing illustrations so they face off the page - unless the effect of going somewhere is desired.

And if you're going to the extra effort of using illustrations (which is good) -- don't smother them with type (which is bad). A drawing in a circular letter needs a frame just as much as a picture on the wall needs one...only in the case of the letter's illustration, the frame is made of space.
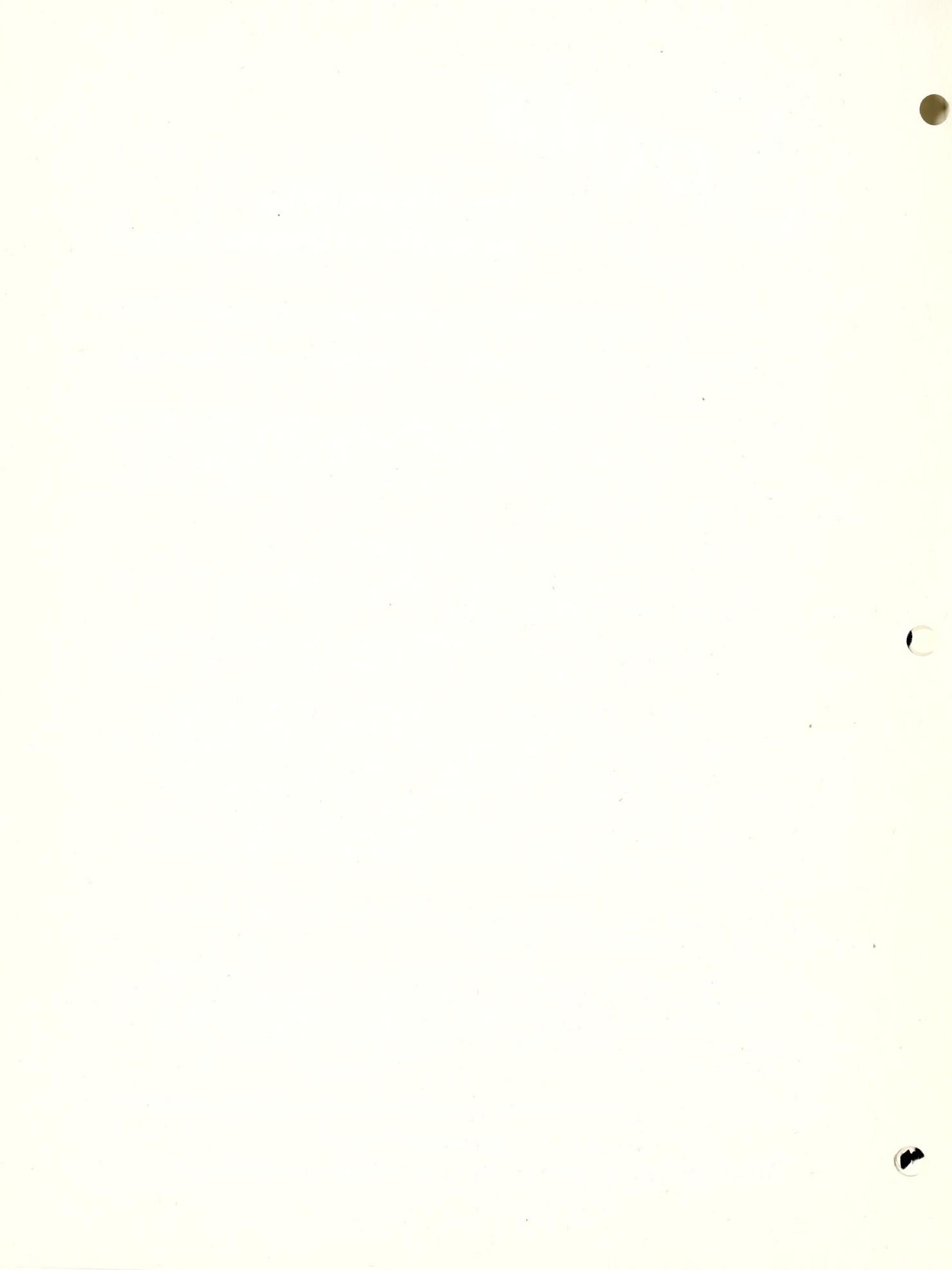
Spots...1

BETTER MARKETS

WAKE UP
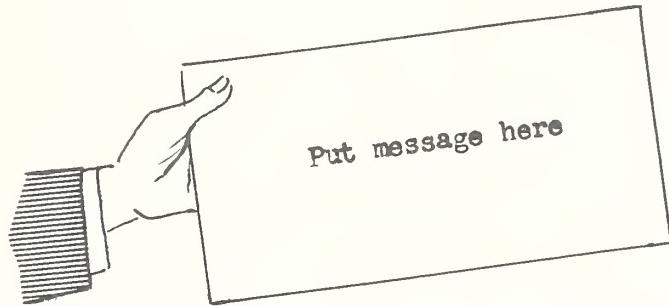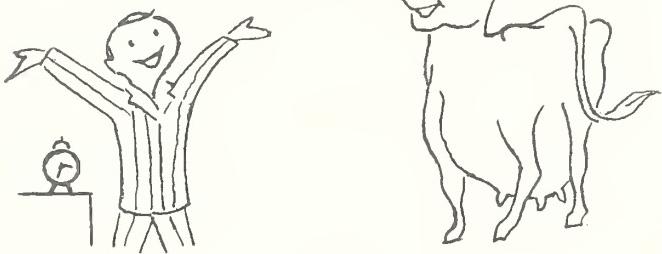
Put message here

THIS MAKES CENTS

WHETHER
OR NOT...
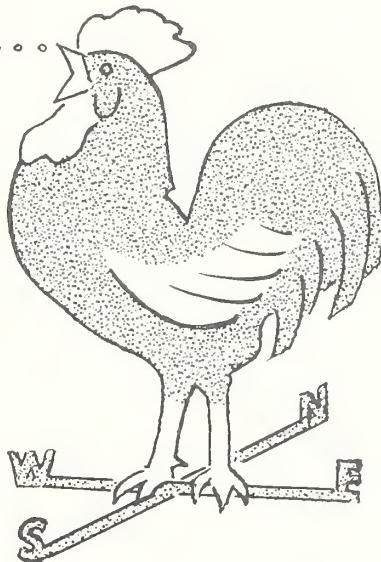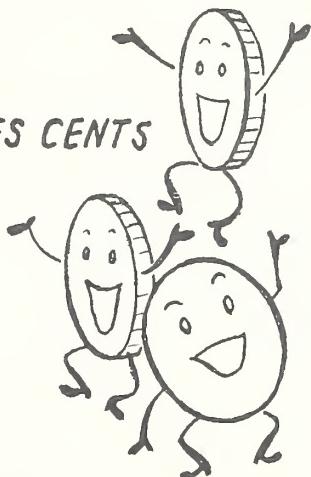
Spots...2

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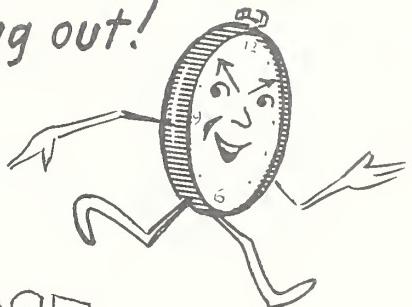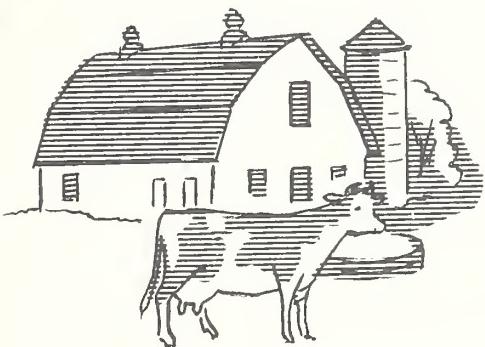
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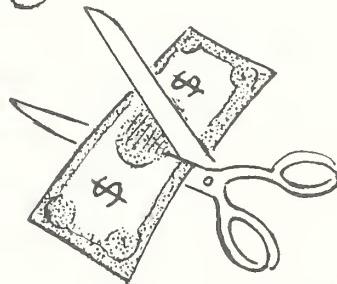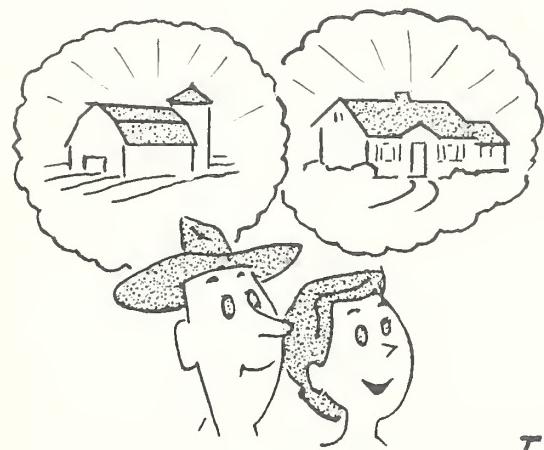
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THEM ESCAPE
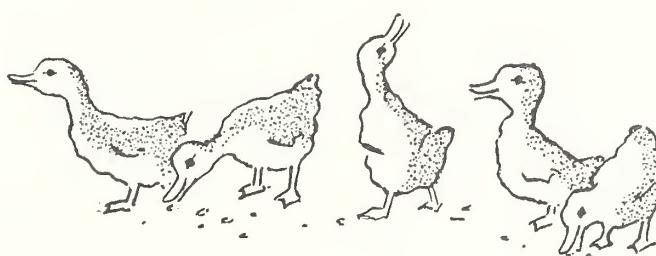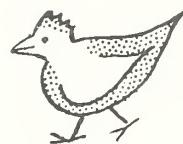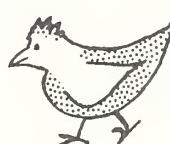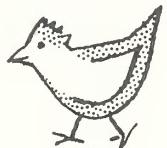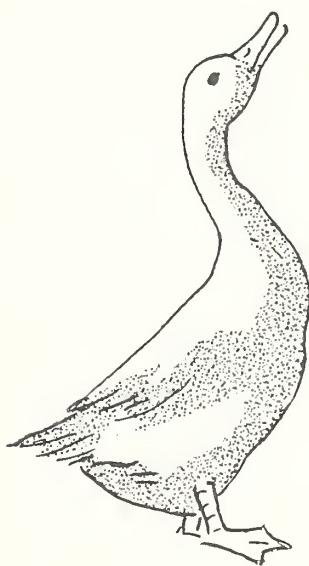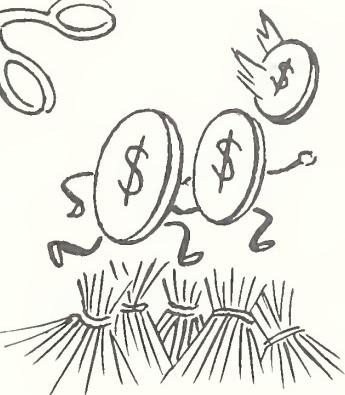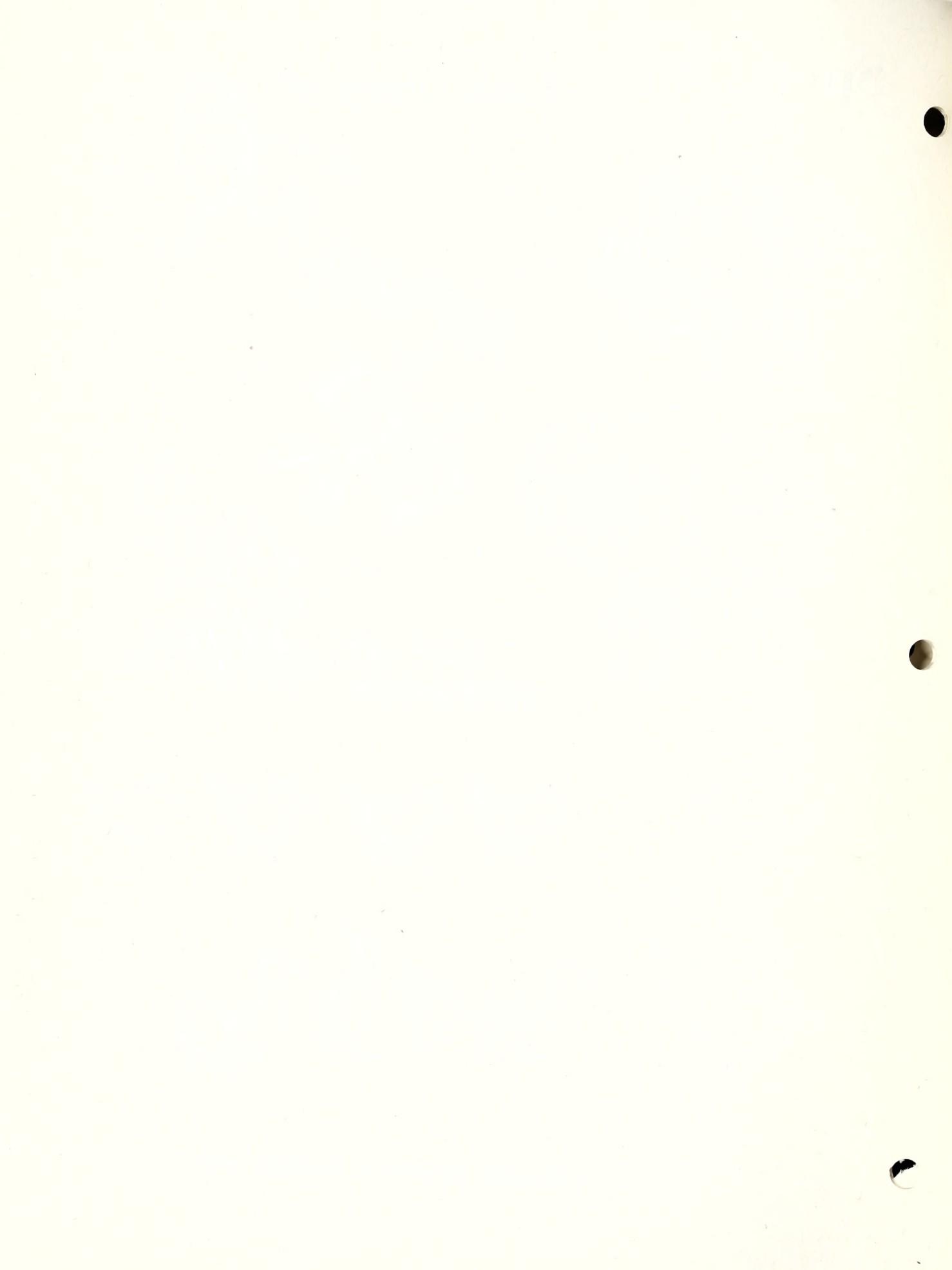
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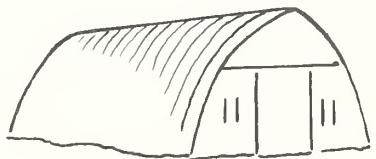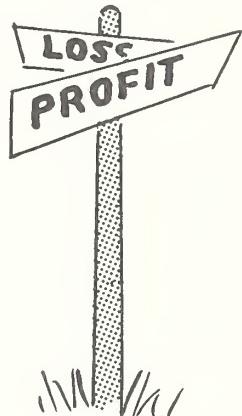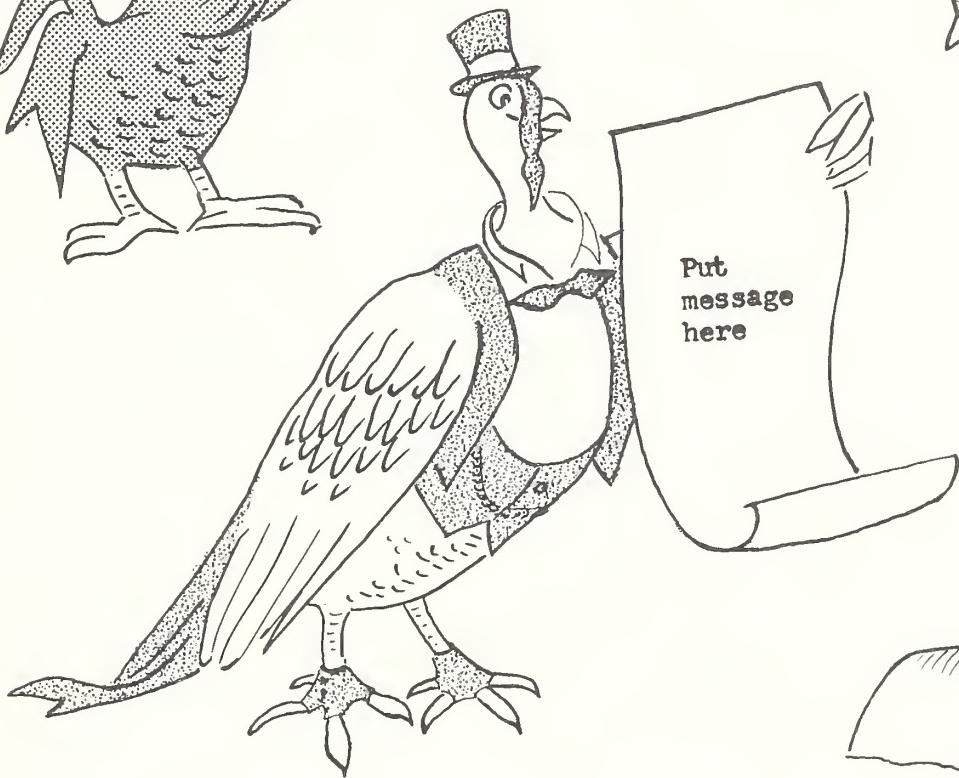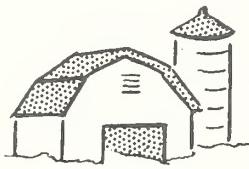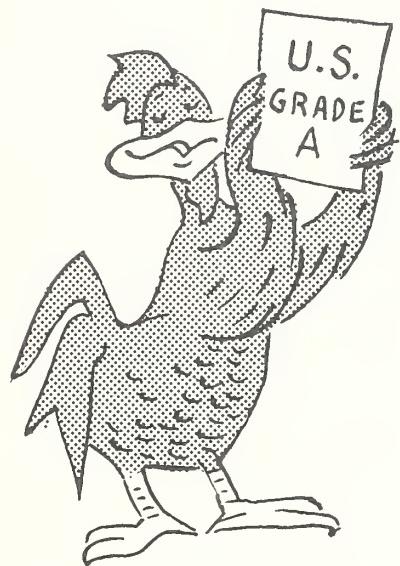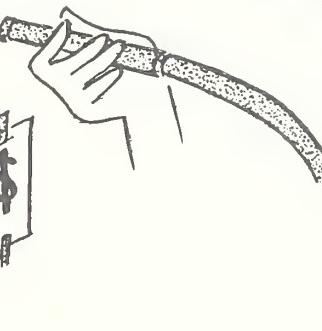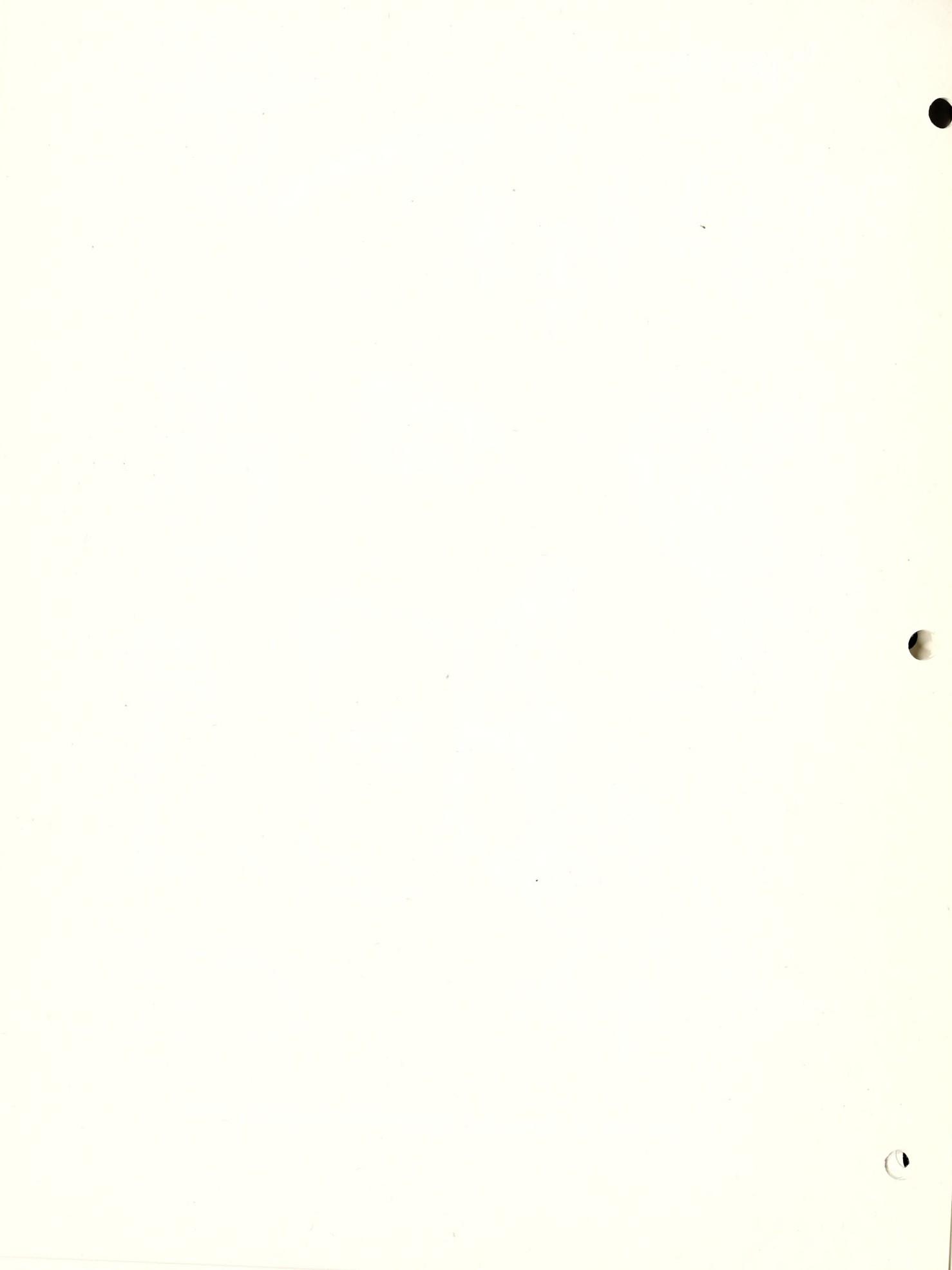
Division of Extension Information Programs, USDA

Spots...4

SAY...

YOU?

BILL
BILL

Division of Extension Information Programs, USDA

Spots...5

SIMPLE AS

A B C
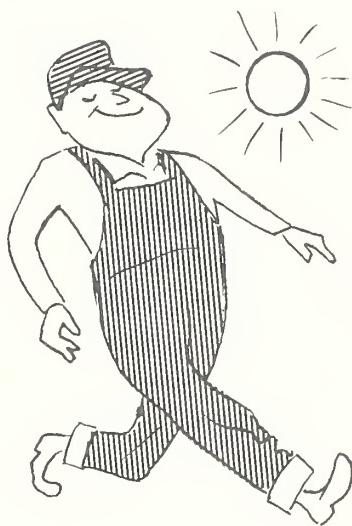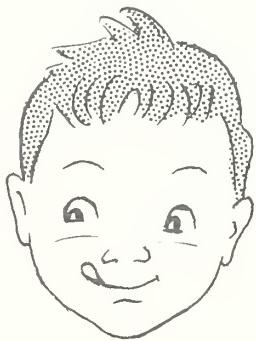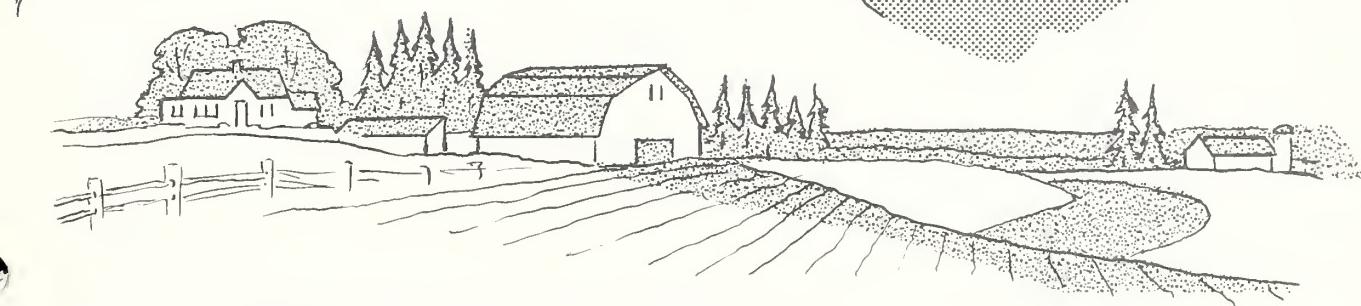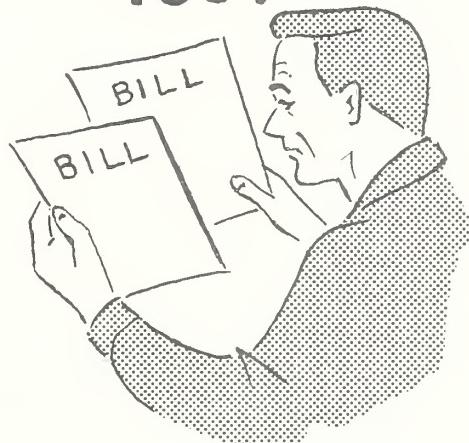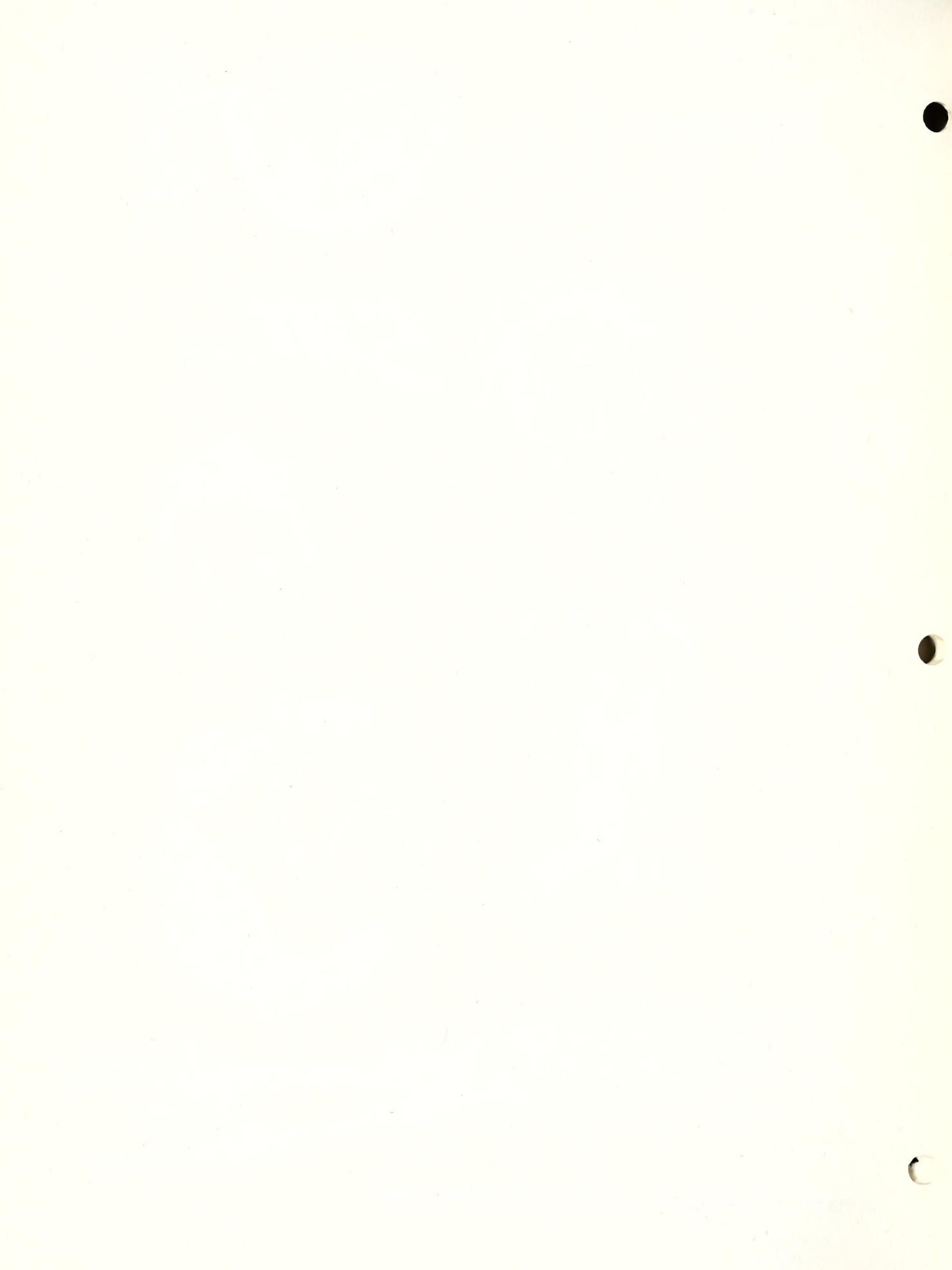
Be protected...
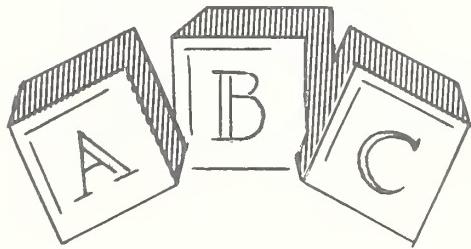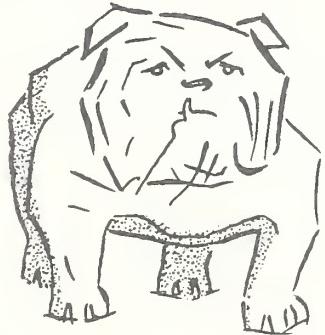
Measuring Up

Same height
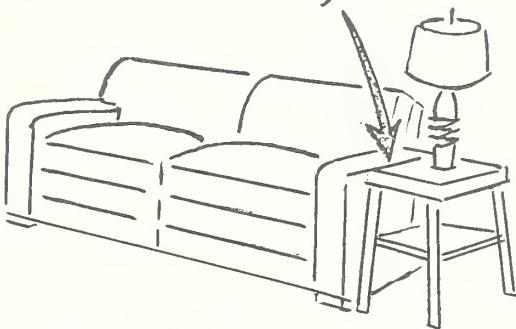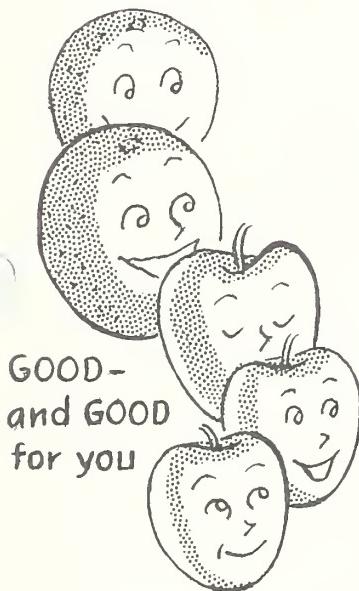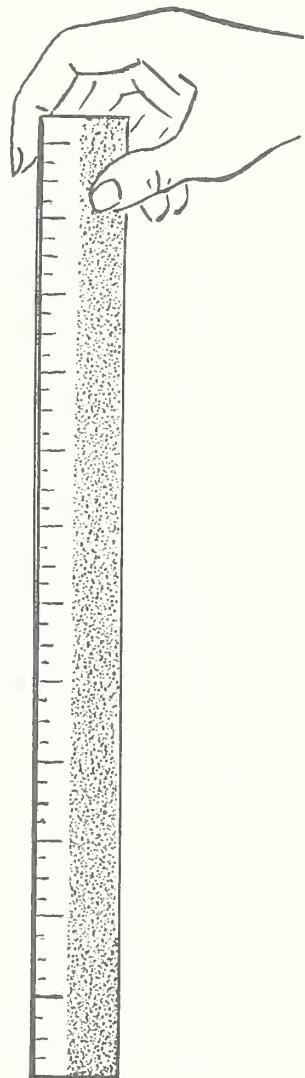
GOOD- and GOOD for you
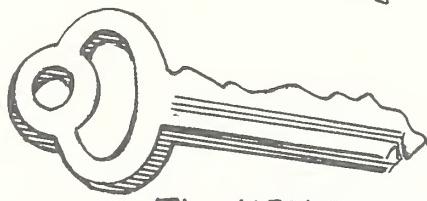
The KEY to

Could this apply to you?

Put message here

Spots...6

We're off to the _____

How do you measure efficiency?

Spots...7

TAKE A
LONG
LOOK

Good
Provider

Division of Extension Information Programs, USDA

Spots...8

HURRY!
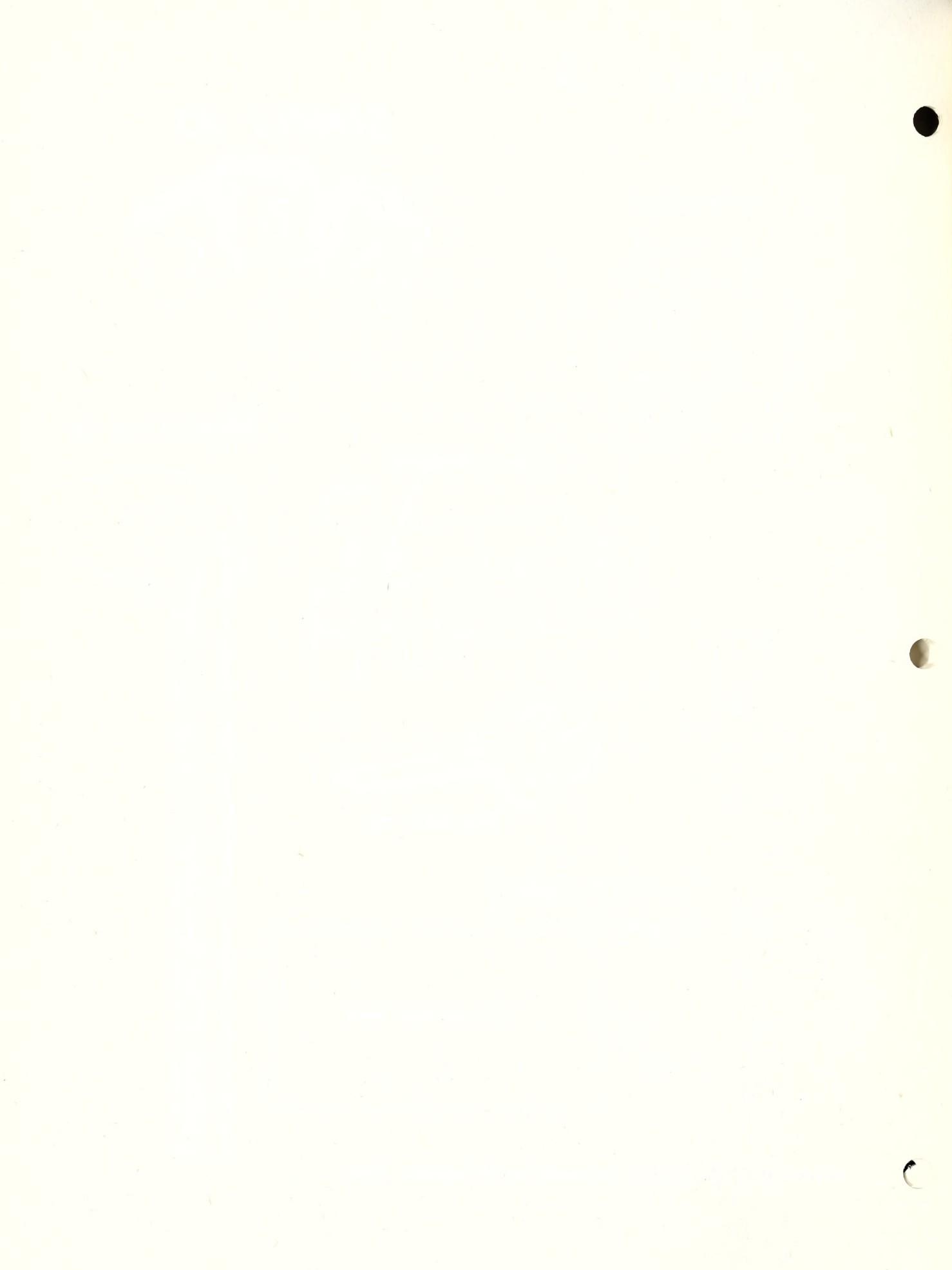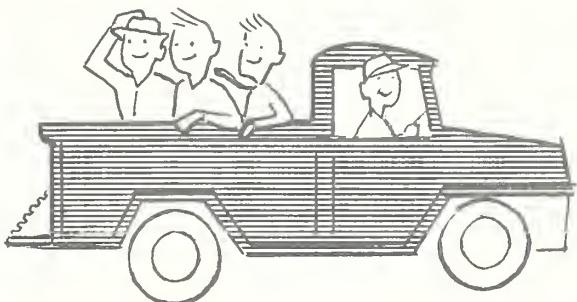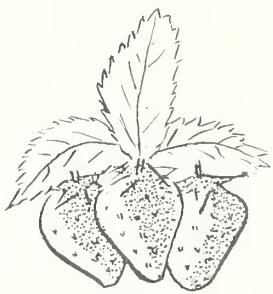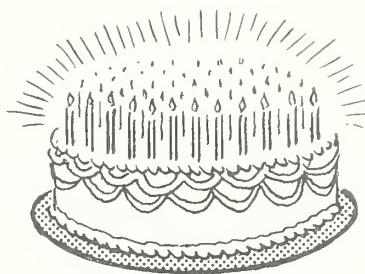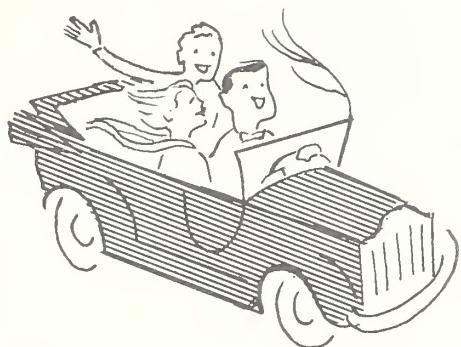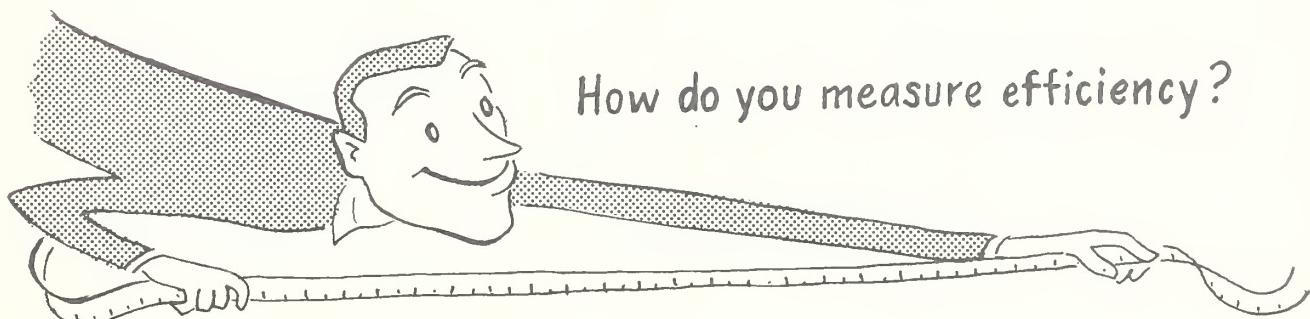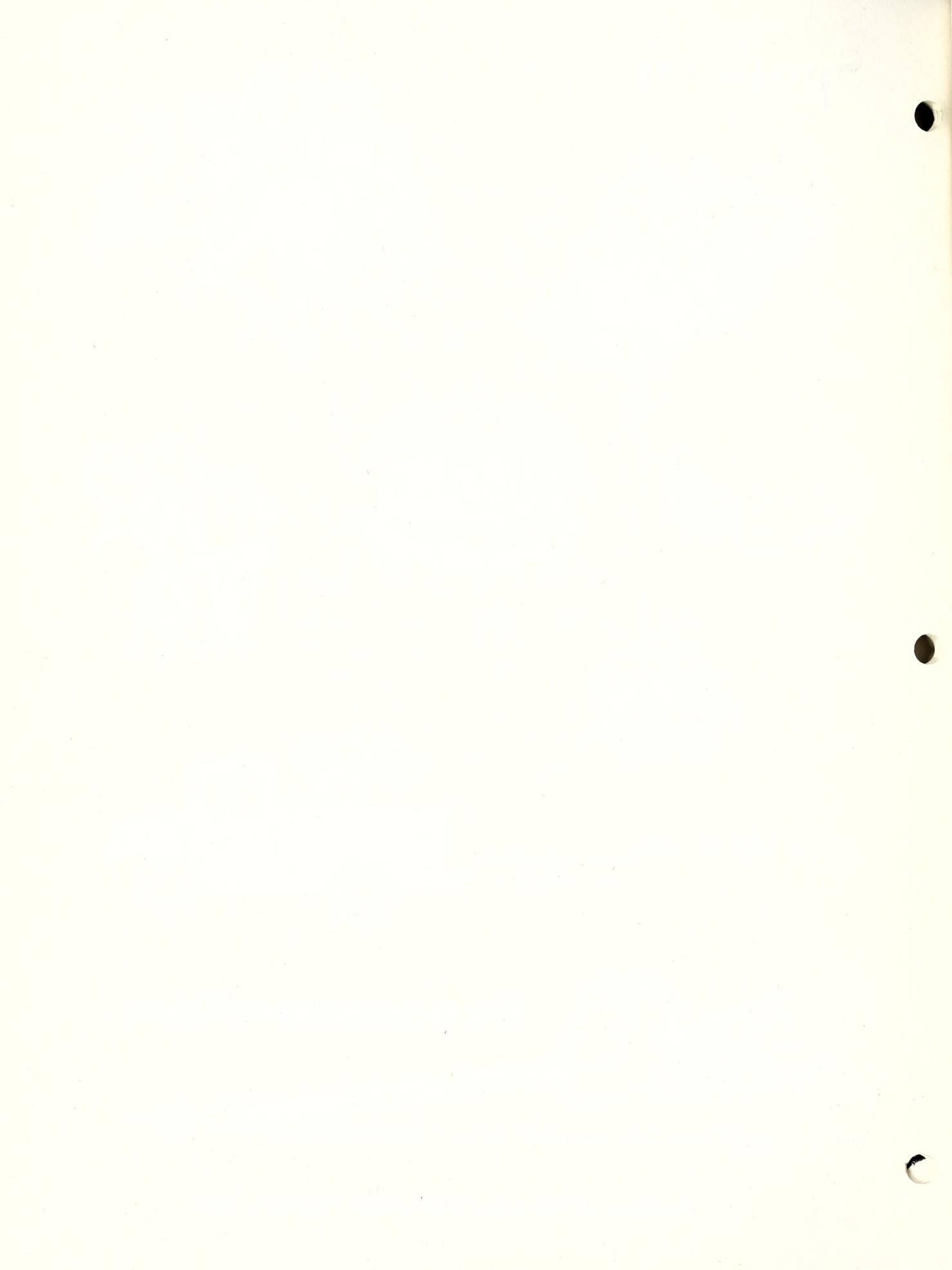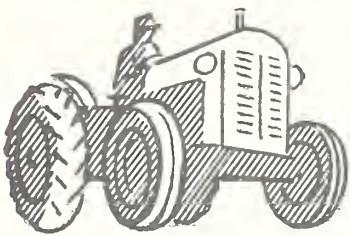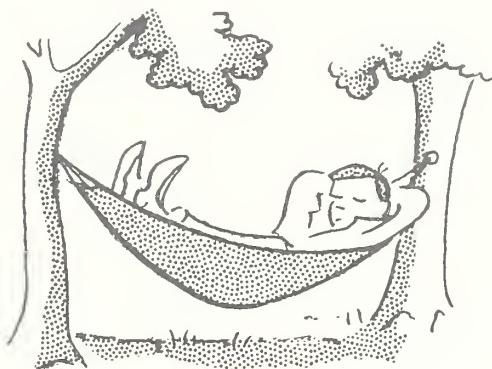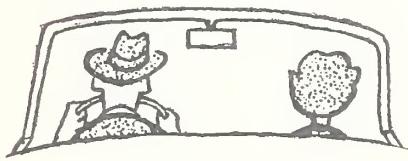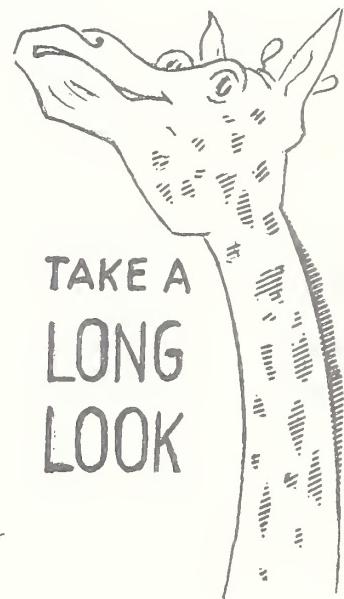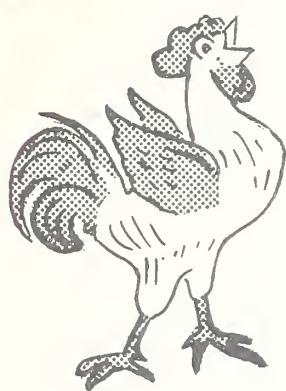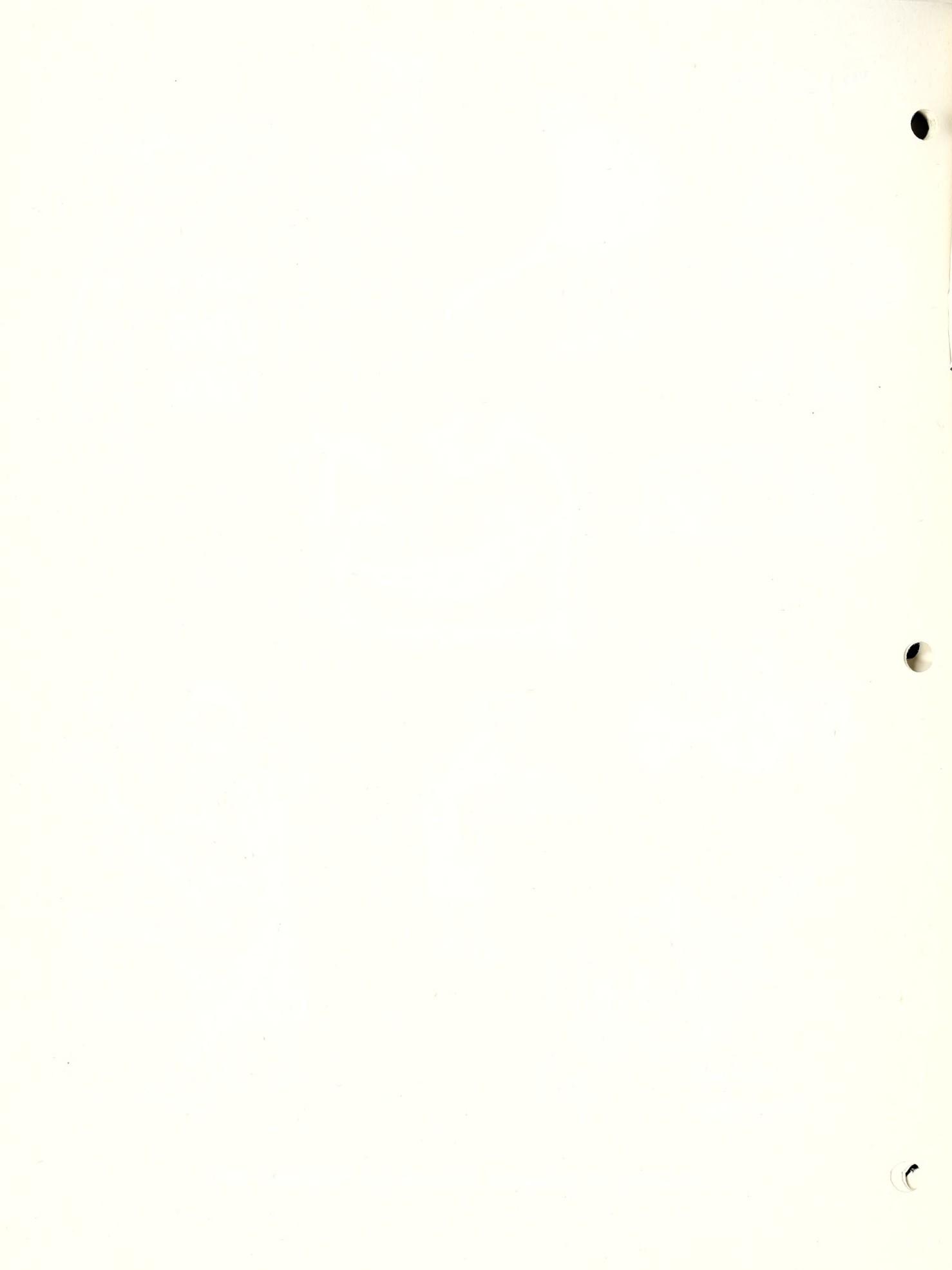
Division of
Extension Information Programs
USDA

ATTENTION GETTERS

1. Verbal captioning and labeling. One of the first places the eyes will rest is on any explanatory verbal areas of a visual. We expect to get the "sense and essence" of the message from the caption. Disappointment results if the caption fails to produce the gist. Captions should be brief and, if possible, be in telegraphic form.

2. Color. The use of color is perhaps the simplest and surest means of attracting attention. The attraction level of the color is related to vision physiology. Red, for example, attracts more attention than blue if the saturation and intensity of the two hues are equal.

3. Brightness. Although certain colors attract more attention than others, it's not the color but the brightness that is really effective. Attention generally is increased by the intensity of light and color.

4. Movement. If the eye sees displacement of an object from one position to another, or if increasing distance between two objects is perceived, attention is almost always produced.

5. Size. Anything large relative to its surrounding, or in general, gets attention. Size, therefore, depends to a large extent on the context and general frame of reference. A six-inch spider captures more attention than a six-foot shark.

6. White space. A surrounding of white space brings attention to any object that it surrounds.

7. Shape. Certain shapes and forms gain more attention than others. In general, asymmetrical, irregular shapes that also have the feature of simplicity are more eye-catching than duller, symmetrical, and complicated ones.

8. Mystery. Presenting the visual communication as an unfolding solution can be an effective attention technique.

VISUAL ATTENTION GETTERS

1. <u>Verbal captioning and labeling.</u> One of the first places the eyes will rest is on any explanatory verbal areas of a visual. We expect to get the "sense and essence" of the message from the caption. Disappointment results if the caption fails to produce the gist. Captions should be brief and, if possible, be in telegraphic form.

2. <u>Color.</u> Using color is perhaps the simplest and surest means of attracting attention. The attraction level of the color is related to vision physiology. Red, for example, attracts more attention than blue if the saturation and intensity of the two hues are equal.

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8. <u>Mystery.</u> Presenting the visual communication as an unfolding solution can be an effective attention technique.

The A, B, Cs of "Look and Run" Exhibits!

A — single idea

B — riefly shown

C — een at a glance

A good exhibit has about (60 seconds) to accomplish three things:
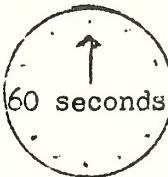
1. Arouse interest
2. Stimulate thought
3. Get action

Procedure

1. Select a committee
   a. Pool ideas (subject matter, ways to show)
   b. Share work (collect materials, build, supervise
                 while shown)

2. Information needed for committee
   a. Audience to be reached (urban, rural, young, old,
                             scientific)
   b. Reason for exhibiting (celebrate event, education)
   c. Exhibit space (floor and wall space, tables, background)
   d. Lighting (natural, artificial)
   e. Electrical outlets (voltage, load capacity, AC/DC)
   f. Money available

3. Purpose of exhibit
   a. Teach facts (give information)
   b. Show process (teach how to do)
   c. Promotion (encourage participation, raise money)
   d. Recognition (show quality, raise standards)

4. Selection of subject
   a. Timely (current problem)
   b. Personal (of interest to audience)
   c. Single idea (specific subject rather than general topic)

5. Organizing subject matter
   a. Determine goal (what do you want viewer to do)
   b. Outline subject matter (should limit to about 4 major
                             points)
   c. Eliminate all subject matter not contributing to goal

6. Select title
   a. Identify the exhibit (tell content)
   b. Short (limit to four or five words)
   c. Simple (short, simple words)
   d. Attract attention - Personal (Your Food Dollar)
                           Action (Make Your Own Hat)
                           Question (How Well Are You Fed?)
                           Catchy (Freeze Food For Fresh Flavor)

7. Determine arrangement
   a. Message not under 30 inches or above 96 inches from floor
   b. Read from left to right
   c. Read from top to bottom
   d. Lead eye to center of interest
   e. Put title at top of exhibit
   f. Balance materials either formally or informally

8. Choose method of attracting attention
   a. Actual objects
   b. Models
   c. Demonstration
   d. Motion
   e. Lighting
   f. Color
   g. Contrasts

9. Illustrations
   a. Photographs at least 8 inches by 10 inches
   b. Photographs dull finish
   c. Art work simple - line drawings, cartoons, water colors

10. Lettering
    a. Horizontal rather than vertical
    b. Be consistent in style
    c. Be sure lettering is large enough to be seen
    d. Lower case is easier to read than caps
    e. Caps are suitable for titles

11. Colors
    a. Use neutral backgrounds
    b. Limit to two or three colors
    c. Have one dominant color
    d. Red is a good accent color
    e. Watch visibility (black on yellow, green or red on white)
    f. Use warm colors (red, orange, yellow) for cooking
                                            exhibits, etc.
    g. Use cool colors (green, blue, purple) for freezing
                                            exhibits, etc.

12. Materials
    a. Backgrounds - cardboard, wallboard, plywood, pegboard,
                     wall paper, corrugated paper, cloth
    b. Illustrations - photos, magazine cutouts, calendars,
                       line drawings, cartoons
    c. Lettering - pen, chalk, crayon, Mystic tape,
                   stick-on letters
    d. Fasteners - glue, rubber cement, staples, tacks,
                   masking tape. Scotch tape, wax

13. Score card

    Effective title (short, personal, active verb)   10
    Suitable subject (timely, personal)   10
    Attracts attention (stopping power)   20
    Holds interest (encourages study)   10
    Conveys message (accomplishes purpose)   30
    General appearance (simple, balanced, orderly)   10
    Workmanship (neat, well constructed)   10

Let's Do A Window Exhibit

For National 4-H Club Week

By Duane I. Nelson   Visual Program Leader

National 4-H Club Week will give you in 4-H a chance to pass on to
other members, non-members, parents, and the community what you have
learned in 4-H. You have learned from 4-H by doing, others can learn
by seeing--seeing the good exhibit you put in a store window. Because
most 4-H exhibits shown during club week will be in store windows, or
other prominent places, they will have to be good to get attention.

THE EXHIBITS COMMITTEE

The exhibit for National Club Week should be a club project. The club
president should appoint an exhibits committee of three. The com-
mittee, with the assistance of the leader, can arrange for a window,
plan, prepare and set up the exhibit and take it down. The number of
exhibits set up during Club Week will depend on the number of clubs
willing to roll up their sleeves.

WHERE TO BEGIN?

Remember how you had to plan when you started your project? You need to
plan for your exhibit, too. You must decide:

- Your audience--Who you want to know your story.
- The purpose of your exhibit--Why you are exhibiting.
- The subject--What you are exhibiting.
- The location--Where you are exhibiting.
- The construction techniques--How to prepare or build the exhibit.

PIN POINT YOUR AUDIENCE

For your exhibit, select one audience. The treatment and the message of
your exhibit are different for an exhibit meant for parents of non 4-H'ers
from an exhibit meant for 4-H boys and/or girls.

If you select non 4-H boys as your audience, then you select the subject
and the message and build your exhibit along the lines that will interest
them. If you have a good exhibit others will be interested in it too.
But your primary concern is the audience you want to reach--parents of
non 4-H'ers, parents of 4-H'ers, other 4-H boys and/or girls, or non 4-H
boys and/or girls.

YOUR EXHIBIT SHOULD DO SIX THINGS:

1. Get attention--it must shout "Hey, look!"
2. Arouse and hold interest--"This could be you!"
3. Create a desire to do or make the thing you are exhibiting--
    "It's easy the 4-H way."
4. Convince your audience that it can be done--"Sure you can be
    a 4-H'er."
5. Get your audience to do what you are suggesting--"Join 4-H
    today."
6. Tell a complete simple story at a glance--"Here's how we
    fixed it."

TWO KINDS OF EXHIBITS

Consider the two types of educational exhibits--one, promotional and the
other, subject matter or "how-to-do-it."

The promotional exhibit tells your audience what 4-H is, what it stands
for, its aims, and goals. The subject matter or "how-to-do-it" type may
show and tell about a project. In this, you select some phase of your
project and show, step by step, such things as how to make a rope halter,
prepare vegetables for freezing, lay out a pattern, or practice first aid.

Whatever topic you choose, hold the exhibit to one idea; use only one
phase of your 4-H program. If you select some phase of first aid, use
one idea--treating a cut or a burn, or you might show what material to
include in a first aid kit. This exhibit would be subject matter. If
you are planning a promotional type, in which you want town or city boys
to join 4-H, pick a project in which an urban boy would be interested,
such as photography.

When you have decided what you are going to exhibit and for whom, next
think about how you are going to show the one idea you have chosen.

YOU HAVE A STORY TO TELL

A book without a plot would be dull reading, like trying to read the
dictionary. An exhibit without a story or message is as dull. And like
a book, the exhibit must have an appealing title that will make you want
to see the rest of your exhibit; not just a label such as "Photography
Project," but an interesting attractive title such as "Want To Be A
Shutter Bug?" or "See The Birdie?"

In an exhibit, this is known as the "Hey, Joe!" If you were at school
and you saw Joe across the school yard and wanted to remind him of the
4-H meeting that evening, you would shout, "Hey, Joe!" This would get
Joe's attention. Then you would tell him, "Don't forget the 4-H meeting
tonight." You gained Joe's attention, then you gave him your message.
This is what any exhibit must do.

GAIN ATTENTION--GIVE A MESSAGE

In a photography exhibit, if you selected the title or caption "See the Birdie," you would need a message. Such as, "Photography is fun," "Join a 4-H Photography Club," or "Join in the fun!" In the exhibit you could show good photos the club members have taken, which would include different kinds and types of photos of people, animals, landscapes, and activities. The activity photos would point up the fun of being a 4-H "Shutter Bug." There are many ideas for exhibits in any one of the projects. With a little imagination and brainstorming on the part of the committee, you can come up with good exhibit ideas.

CHOOSE YOUR LOCATION

Before you go much further you should decide where your Club Week exhibit should be placed to reach your selected audience. Possible locations are:

> Exhibit Case at School   Drug Stores
> Department Stores   Camera Shops
> Post Office   Hardware Stores
> Banks   Garden Stores
> Electric Company

If you choose photography as your exhibit for club week, camera shops or drug stores might be the logical place. A clothing project might be shown in a department store window. A promotional 4-H exhibit could be set up at school, in a bank, or in the post office. In small communities the place could be a country store, the court house, or the window of a cafe. The audience you are trying to reach will determine the best location.

AND NOW "THE HOW"

But, before you pick up a hammer or saw or begin to gather your exhibit material, make a sketch or a model of your plan. Too many exhibits are "put up," with no pattern to follow.

You need a pattern or a model in which your design has been planned. When you use a definite design or pattern, you lead the audience step by step throughout your exhibit. Remember to keep the design simple!

Beware of clutter. Clutter is the worst enemy of an exhibit. The fewer elements included the better.

The patterns and contrasts you can achieve with two or three well-related objects have more dramatic impact than you can get from many objects.

A pattern is a valuable ally. If you have three things to show, try displaying them at different heights. If you display several objects, pick out the most important one and build the design so that the subordinate objects focus the visitors' eyes on the important one.

EXHIBIT AT EYE LEVEL

We see best at eye level. Too many exhibits in window displays show the objects on the floor of the display window. Eye level for most people is about 5' 3". Pictures and objects should not be higher than 7' 3" or lower than 3'. To get your displayed material off the floor of the window in which you are exhibiting, use risers. A riser is any box-like object, round or square, with varying heights upon which to display objects. These risers can be placed to fit your design.

What can I use for risers?
Shoe box   Ice cream container
Oatmeal box   Nailkeg
Coffee can   Mover's barrel
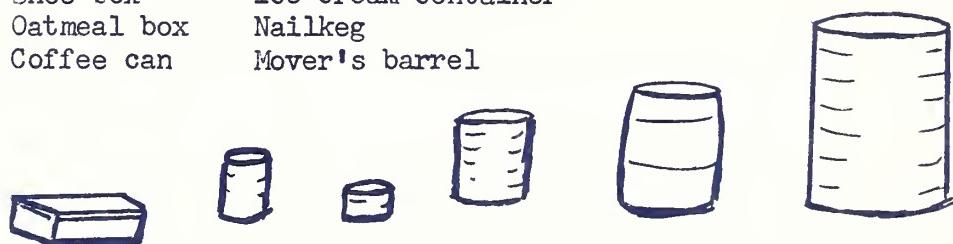
To attract people to your exhibit, take advantage of the point of interest or "hot spot." There are four possible hot spots in your exhibit.
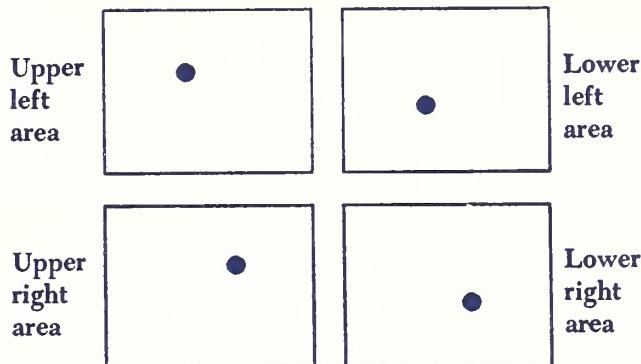
POSSIBLE HOT SPOTS

Use only one point of interest or hot spot, then build your design or direction from that point of interest.

Never use "dead center" as the point of interest. Dead center is what the term implies--dead. Your exhibit must have direction. From dead center there is no place for your eye to travel to give the exhibit balance and direction.

Plan your design starting with the point of interest. Your design could be an "S" or any one of several other simple figures. If you use an "S" design, your point of interest will be in the upper right corner of your rectangle.

Other designs could be: Z

C   REVERSED "C"

Sleepy V − <

Reverse C − ᗡ   Point of interest
                       or hot spot
Reverse S − ᔕ

Check   − ✓

IT'S WHAT'S UP FRONT THAT COUNTS

First the background--window displays are set up in units. You need a background to frame your exhibit within the window. Don't put your exhibit to the back of the window but bring it to the front, where it will be readily seen.

If you are fortunate enough to be using one of the large department stores, or stores having regular window displays, the window decorator for the store may have backgrounds and other props you may borrow. The decorator is also a good resource person to help you plan.

BACKGROUND IDEAS

The three simplest background shapes are:

    Modified "U"
    Modified "L"
    Flat background or shadow box

MODIFIED "U"
    The modified "U" background
    is made up of three panels,
    two side panels and one
    panel across the back.
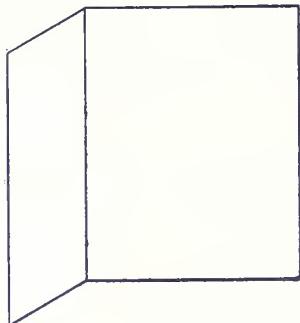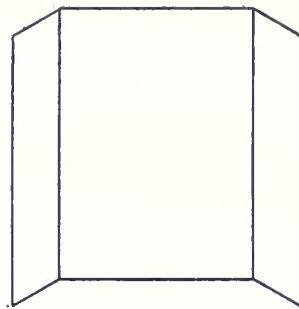
MODIFIED "L"
    The modified "L" is a two-
    panel background.

SHADOW BOX
    The flat background or
    shadow box is used in
    either a vertical or
    horizontal upright
    position.

Don't be a "square." The shape for your background should
be rectangular, never square. Studies show that a square
is less pleasing to the eye than a rectangle.

The size of your background, of course, is determined by
your allotted space.

OBJECTS--MODELS--ARTICLES

When possible, use the real object or article. Live baby chicks or
ducks are always attention-getters. Most stores will permit the use
of a few baby chicks or ducks. Miniature models: Use such things as
toy tractors, play food, and toy sewing machines, or dolls and doll
clothing to substitute for the real thing. (Do not use real food.)

Figures: You can make figures of people with such materials as pipe
cleaners, match sticks, and paper. These will be very effective.

Pictures: You might use drawings or sketches to help tell the story
in your exhibit. As a last resort, use pictures cut from magazines.

USEFUL MATERIALS

Seamless papers
Wallpaper
Corrugated paper
Heavy cardboard
Discarded mattress boxes (From these
  you can make your background.)
Fabrics
Masking tape
Stapling gun
Pins
Tacks
Lettering
Felt-point and other types of
  lettering pens and pencils

Yardsticks
Brass paper fasteners
Scissors
Rubber cement or glue
Waterpaints (These are non-
  flammable and therefore
  excellent for indoor use.)
Lumber
Hammer
Nails
Saw
Extra light bulbs and plugs
Spotlights
Extension cords

You'll want to collect this material, of course, before you start to
build your window exhibit.

ADD SOME COLOR

Use light or pastel colors for larger areas; use bright, bold colors
sparingly. For instance, don't cover the entire background with a bold,
bright red. Cover with a color like light grey, tan, or beige, and use
the red or other bright color for accent.

LETTERING--KEEP IT SIMPLE

Lettering should be simple, also clean and well spaced. Don't "decorate"
your words or make your letters "fancy." Lettering books and stencil
guides are available in book or dime stores. Don't try to mix colors in
a word. You could use two colors in your message, say red and black.
One word might carry more punch in a different color or in a different
type style.

You can use yarn, clothesline rope, plastic rope, wire or even strips of
cotton batting to form your letters for your caption and message.

For main and subheadings, you can buy the well-formed, cutout letters,
in wood, plastic, cardboard, and gummed paper. They can be mounted with
any of the quick-drying glues or with rubber cement. When mounting
letters, space the letters by eye--not by measurement. Toward the
front of your exhibit in legible type or lettering, use a credit line.

Minimum size of letters for window display:

Main caption----------3"   Identification labels-------1"
Message---------------2½"   Credit line----------------½"

In a window display do not use detailed paragraphs or long sentences.
It is a waste of time because such paragraphs and sentences will not be

read. Use three words or less in your main caption--one word is better. Use five words or less in your message--three words are better. Use one or two words for identification labels, and include a short statement giving the club name and where your audience can get more information.

A suggested credit line is: "Exhibit prepared by the "Shutter Bug" 4-H Photography Club. For information on becoming a 4-H "Shutter Bug," write to, or stop in to see, John Smith, Blank County 4-H Club Agent, County Extension Office."

Keep your exhibit simple--one idea--have a message--use color--use your imagination------and GOOD LUCK!

For more detailed information on exhibit planning see, "Me, Plan An Exhibit? Why Sure," available from the county home demonstration agent.

After setting up your exhibit, judge it by this self-rating score card:

SUGGESTED EXHIBIT SCORE CARD

The exhibit: Points

1. Effective message (caption or title sign):   15
   Short, catchy, appropriate, well worded to cover
   subject and suggest appropriate action.

2. Draws attention: 20
   An attention-getter that reinforces the main idea.
   Something unusual--motion, light, design, and/or color.

3. Holds attention: 25
   Tells a coherent, clearcut, one-idea message quickly.
   Arouses curiosity about the subject. Has systematic
   arrangement, easy to follow to tell the story.

4. Sells 4-H: 15
   Appeals to such motives as desire and need for income,
   health, comfort, convenience, recreation.

5. Presents pleasing appearance.   10

6. Uses explanatory material effectively: 10
   Material brief and easy to read. Size of charts, maps,
   placards and letters adequate (see letter size, page 7).

7. Tells where assistance and more information are available.   5
                                                                            ―――
                                                         TOTAL POINTS   100

How did you rate: A score in the 90's---------------good
                                    80's--------------acceptable
                                    70's or lower-----rework your exhibit

The following exhibits are suggestions. If you use these plans, change the exhibit to fit the project you wish to show. Also feel free to change the captions.

U.S. POST OFFICE

Exhibit: Promotional--General 4-H   Props: A flat background about 4' x 5'
Audience: 4-H boys and girls   Cutouts of a 4-h boy and girl
Location: Post office, banks, co-op stores
            Captions: We're 4-H'ers. In 4-H We: Live usefully
                       Learn to drive safely   Earn from projects
                       Serve in community activities

Wouldn't you like to join?
See your County 4-H agent
National 4-H Club Week

TOWNS CLOTHING

Props: Risers of different heights--round or square
        Sewing machine and a piece of material (2 yards)
    Material or items: 1 pop-over made in 1st year clothing
                        Skirt or blouse made in 2nd year clothing
                        Party dress made in advanced sewing, and accessories
        Captions and legends: Start the Bobbins With the Robins
                               4-H'ers make clothes
                                    Pop-over   Party dress
                                    Skirt or blouse   Accessories
                               Want to make your own clothes?

> Join 4-H today!
> Call your County 4-H Agent

- 10 -

Exhibit: Promotional--Photography Project
Audience: Non 4-H boys and girls
Location: Camera, department, drug stores
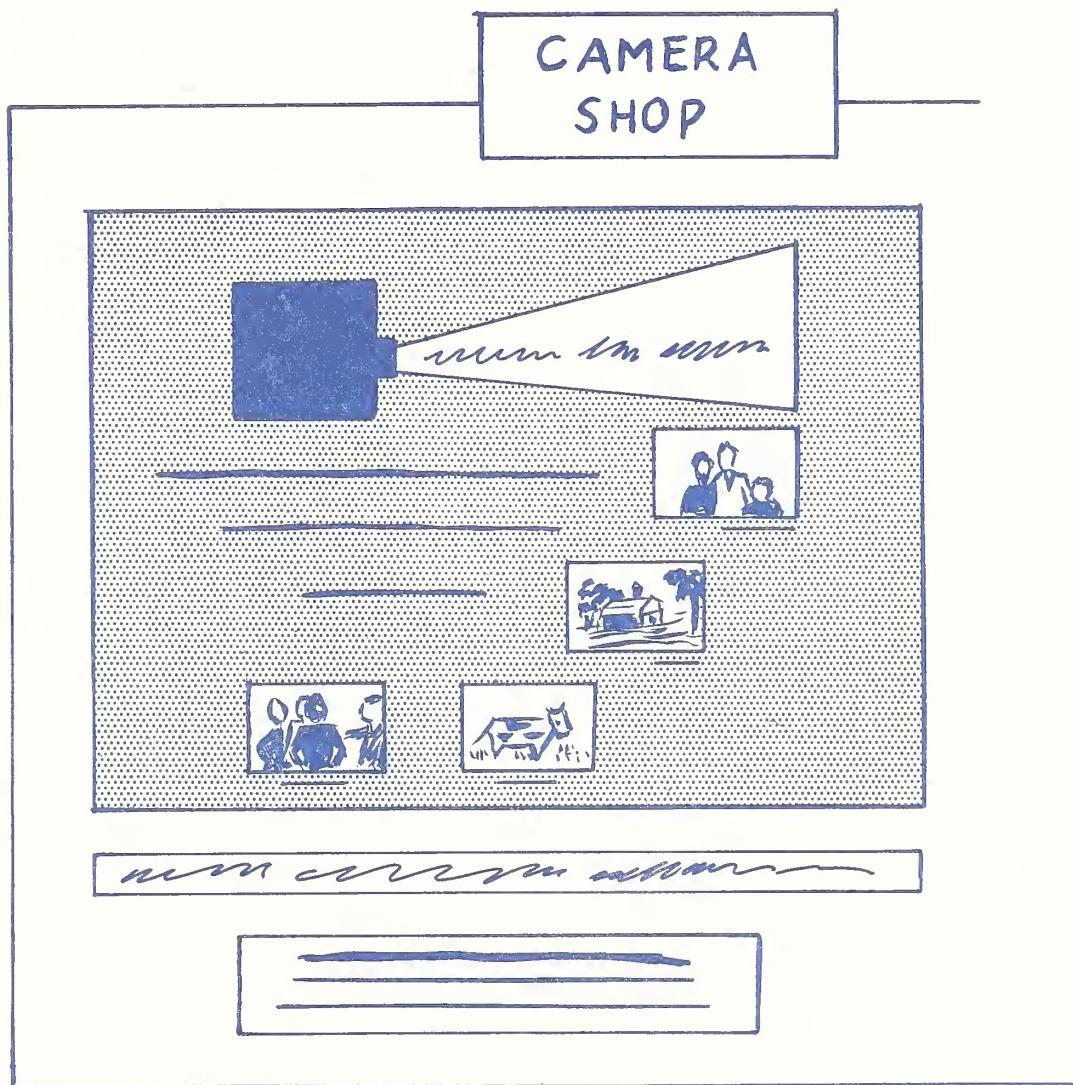
Props: Shadow box or flat background 4' x 5'
         Camera, a cutout of a camera, or a picture of a camera
     Materials: 4 or 5, 8" x 10", 4-H photos
         Captions and legends: See the Birdie!
                                Make Photography Your 4-H Project
                                National 4-H Club Week

Join 4-H in Your Community
See Your 4-H Agent--Phone--

- 11 -

Exhibit: Promotional--General 4-H
Audience: Non 4-H boys and girls
Location: Banks, stores, post office, schools
     Props: Background to fit the window--4' x 5', or 5' x 7'
               Large cutout shoe--cut from cardboard or construction paper
               Cutouts of children--magazines, catalogs, etc.
          Captions: There Was A Family.
                      National 4-H Club Week
                      You may not live in a shoe but,
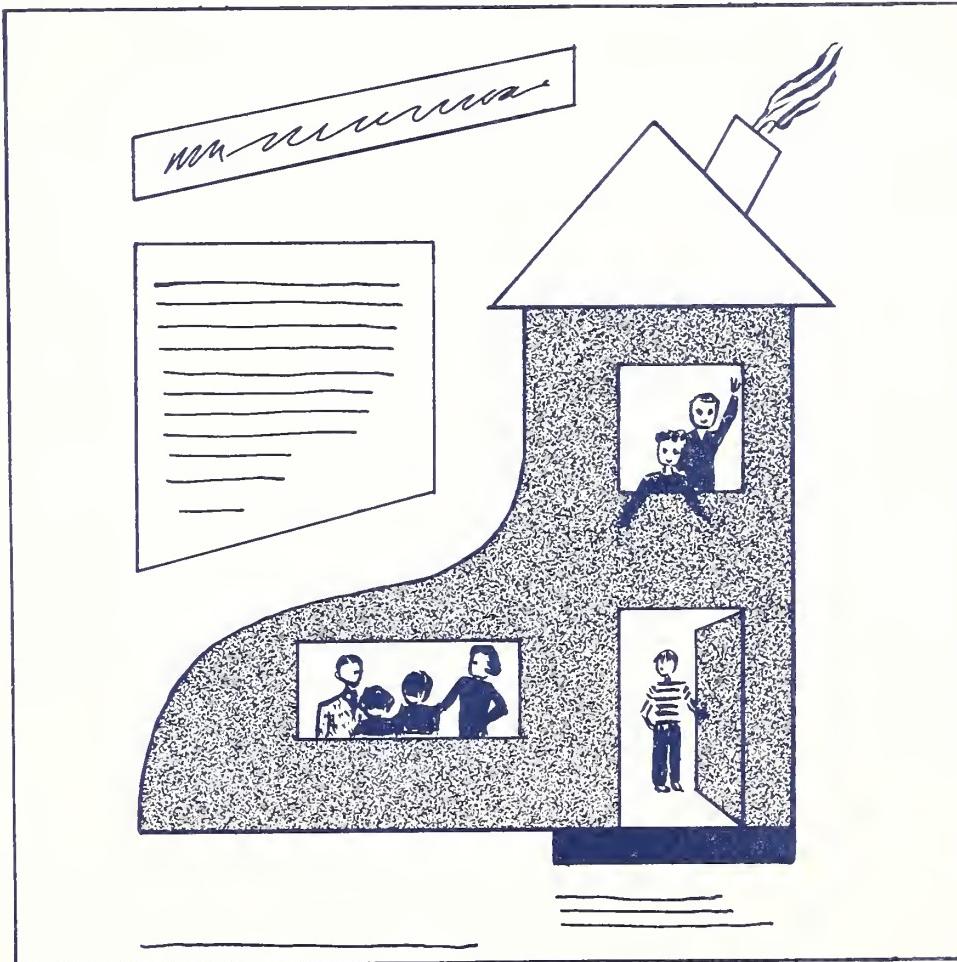
There was a large family
  Who lived in a shoe.
With so many children--
  Six or seven, quite a few--
They lived in a town
  Where there was little to do
So they got into mischief--
  And some trouble too.

Then they heard about 4-H--
  From an exhibit, they say,
Now the shoe dwellers are 4-H'ers...
  Keeps them busy all day.
Mom and dad are the leaders--
  They like 4-H too.
And that's the story of the family
  Who lived in a shoe.

You can join 4-H....
Call your County 4-H Agent.
Prepared by Friendly 4-H Club

Issued
October 1960

ME, PLAN AN EXHIBIT? WHY SURE!

Duane I. Nelson
Visual Program Leader

This material is for home demonstration agents to use as a guide in planning their exhibits and helping local leaders to plan exhibits for National Home Demonstration Week.

Home demonstration agents and extension club members are interested in preparing effective educational exhibits easily and at a minimum cost.

Exhibits are especially helpful in creating interest in new solutions to important home and community problems. The purposes of an exhibit are to develop interests of those who see them, influence their attitude, increase their knowledge, and stimulate their action.

PLANNING THE EXHIBIT

Exhibit Committee Important

Each extension club should have an active exhibits committee of from three to five persons. This group can pool ideas on choice of subject matter and decide ways to display the material and share the work.

Figure 1.--An exhibits committee is shown with the model of the exhibit they "brainstormed" during an exhibits session. They selected their subject, decided upon a message, sketched a design, made the model, and filled in the elements in miniature. This was the blueprint for the "table top" exhibit they made for achievement day.

The home agents responsibility to the committee should be in giving advice and ideas to the committee--provide them with help on how to build an exhibit, and show ways and means of getting and using needed material.

Figure 2.--The exhibits' chairman goes over the scale model of the achievement day exhibit, as planned by the committee. She told her club members what subject the committee selected, pointed out the point of interest or "hot spot," told what message was being used, and how the exhibit was to be built.

Your exhibit will have lots of competition. So it has to be different. It must be simple with a one-thought theme, and not bogged down with complicated themes, too many words, and meaningless phrases.

Then too, some projects do not lend themselves to an exhibit. These should be promoted by other media. So consider the pros and cons of exhibiting. Consider your subject matter.

DON'T EXHIBIT IF:

- your subject matter is unrelated to the season, the place, or the event.

Federal Extension Service
U. S. Department of Agriculture

- you are simply filling up space.

- you don't have or can't get help.

- your treasury is down to its last $1.98.

- your message is many sided and needs careful explanation.

If any of these is true, then think about some other media for telling your story.

DO EXHIBIT IF:

- your message can be expressed visually and dramatically with a few simple words.

- the spot for the exhibit is where most of the people you want to reach will see it.

- your subject matter is "in season."

- you have plenty of assistance.

- your budget will permit you to spend some money.

Figure 3.--A shadow box exhibit is easy and fun to make. This very simple one-theme or one-idea exhibit stresses the importance of reading labels. This was planned for an achievement day held during National Home Demonstration Week.

CAUTION

In the early stages of planning the exhibit, it is easy to get bogged down into a maze of materials, cutouts, color schemes, models, and ideas. When this happens the end product, the exhibit, disappears from view. And the exhibit becomes a hodgepodge of "everything and nothing."

Avoid this situation by looking at the WHY--WHAT--WHO--HOW.

Forget about the "how" to build the exhibit until you have answered the basic questions of "why" you are exhibiting, "what" you want to say or accomplish, and "for whom." Always keep in mind that your exhibit is a supplement to your extension program.

Why

An effective exhibit:

1. Gets and holds attention.

2. Reaches women who do not belong to extension groups.

3. Motivates people to accept new methods, change practices, and raise standards.

4. Teaches a method or practice or can show new equipment in a few moments.

What

Since your audience will be urban and rural women, they will be interested in meal preparation, clothing care, beautifying their yards, redecorating their homes, remodeling their kitchens, and buying new equipment.

Decide what the county office or the club has to offer in helping people with these interests. For instance, an exhibit could help homemakers prepare house plans, select fruits for freezing, know about proper diets for children, know about aids in meal planning, select correct color combinations for the home, and learn how to refinish furniture. Exhibits could also help to increase extension club membership. You can make excellent exhibits on the "how to's" and the "do-it-yourself" type of projects.

Select Your Message

After you have convinced yourself and your club members that exhibits will tell your extension story then select your message. Not just a label--but a message, and an "eye-catcher."

"Yoo Hoo Mrs. Jones!" An exhibit has to have an "attention getter." It is the voice of your exhibit. The "attention getter" must stop the passerby the same as if

2

Figure 4.--The county home extension group that planned and built this exhibit took the "Hey Mrs. Jones" of on exhibit literally. With good design, the viewer cannot help but follow thru the entire exhibit.


Figure 5.--Here's another simple but effective exhibit at an achievement day. This club had studied home nursing. Their exhibits' committee, thru their exhibit, told others how they too could benefit from a home nursing project.

you were to call to someone across the way to get her attention. You shout "Yoo Hoo Mrs. Jones!" You have gained her attention. Now give her your message--"Don't forget Extension meeting this afternoon, 2:30. We're electing officers."

Notice what you did to gain Mrs. Jones' attention. You raised your voice, you spoke directly to her, you told her what you wanted her to do, you told her about something important to her, and you told her quickly. Handle the message in your exhibit the same way. Put your exhibit's message into a few words and direct it to whom the idea is intended.

The "Oh Yes, You Can" is provocative while the design carries the viewer thru the exhibit.

You raise your voice in an exhibit by building your exhibit on a clearcut, simple plan and using a bright color, strong lines, and the fewest possible number of elements. Most exhibits suffer from an overdose of too's--too many figures; too

many facts; too many colors; too much copy; too many models; or in other words, too many elements.

Who

Your goal is to get the right message to the right people in the most direct and effective manner. At your achievement day the viewers or your audience will be mostly rural and urban women--consider their interests.

How

After you have selected your message, you are ready to begin with the "how to" to express your message. Make a check list of your resources.

1. Can you do something? With demonstration material that you have available, your range in this respect is limitless.

3

2. Have you objects to display? Such items could be unfinished and finished chairs.

3. Have you models to show? Models could include furniture, windows, closets, rooms, or equipment.

4. Would photographs be effective? A minimum size of 8 x 10 is recommended. Smaller photos will not show up. The maximum size for your photo is limited only by your space. Photos are expensive so, you may decide against using them.

5. What service can you command? The exhibit that you build will depend on assistance with carpentry work, artwork, lettering, photography, etc. With the above questions at least partially answered, you are ready to go to work on your exhibit layout.

Planning Your Booth

At achievement day during National Home Demonstration Week, your audience has come to see. These folks will stop more readily, stay with you longer, and view your display at closer range, than the folks at a county fair. But you still have competition, so your exhibit has to be simple and eye-catching.

Factors to go over before beginning work on your exhibit.

FIND OUT:

- the space (booth, flat wall, card table top, corner).

- the dimensions or size of exhibit space.

- if there are outlets.

- the fire regulations.

- the background of the exhibit area.

- the theme of the event, and perhaps something about your neighboring booths.

After you have this information, develop a plan (rough sketch), then build a scale model of your booth, filling in the elements in the scale model. Making a scale model may seem like paper-doll work, but it is very important in setting up a good exhibit.

A scale model will help you see where you are crowding; where you are confusing separate elements; and where the point of interest or "hot spot" of your space is.

Point of Interest or Hot Spot

We are concerned with four main points of interest in any exhibit. Plan your exhibit within a rectangular area, whether it is to be a card table top exhibit, a booth, or a wall type. Ordinarily your exhibit would be horizontal. In the case of a card table top, your exhibit would have to be vertical to get your message and design up to eye level.

The "hot spot" or the point of interest can be located in one of four different areas: Upper left-hand area; upper right-hand area; lower left-hand area; or the lower right-hand area of the rectangle. By making a sketch and a scale model it is much easier to locate the point of interest. Your "eyecatcher" or the "Yoo Hoo Mrs. Jones" should lead to the point of interest to strengthen your exhibit. Use only one point of interest, and from this point carry out your design. Most exhibitors use the upper left as first choice for the "hot spot" or the upper right area, depending upon the design.
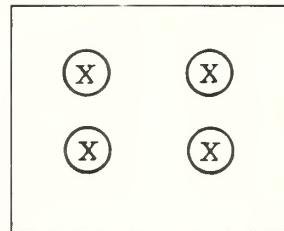
Areas of points of interest--
or "Hot spots."

Plan your background with the shape of a rectangle in mind. You have several choices:

One is the modified "U"--

Another choice is the modified "L"--
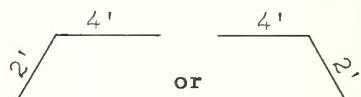
One advantage of these types is that they can be made self-supporting.
Another choice is the straight, flat rectangular background.

4

Exhibit at Eye Level

Keep in mind that we see best at eye level. Too many exhibits display objects at table top height or below. The patron or visitor to your exhibit must bend over, and perhaps change glasses in order to take it all in. The average person won't. Eye level for most people is about 5' 3". Pictures and small objects should not be placed higher than 7' 3" or lower than 3' from the floor. Objects at 3' would be low. To get objects up off the floor or table use risers.

If your display is on a card table top, some of the material should be on risers. A riser is any box-like object, round or square, on which to display objects up off the floor or table top to fit your design.

Figure 6.--This accessories exhibit was one of many "card table top" displays at a countywide home demonstration achievement day. The background was made from a discarded mattress box. The hat, shoes, and purse were on "risers" which were necessary to carry out the design. The point of interest (the dress) is in the upper right area of the rectangle. The attention getter, the key, carries the message and focuses attention on the dress. The stippled background added a touch of spring to this summer wardrobe exhibit.

If your booth is large and deep, you will have a better looking exhibit if you cut down the depth by using screens. Move your exhibit toward the front so patrons or spectators can see your exhibit. A large area cut down to a small area is much easier in which to exhibit, and makes for more compactness--a better looking exhibit.

Lettering--Keep it Simple

Lettering should be simple, clean, and well spaced. Don't "decorate" your words or make your letters "fancy." Lettering books and stencil guides are available in book or dime stores. Don't try to mix colors in a word. You could use two colors in your message (red and black). One word might carry more punch in a different color or in a different type style.

For main and sub-headings in your exhibit, you can buy the well-formed, cutout letters in wood, plastic, cardboard, and gummed paper. They can be mounted with any of the quick-drying glues or with rubber cement. When mounting letters, space the letters by eye--not by measurement. Toward the front of your exhibit in legible type or lettering, use a credit line:

"Exhibit prepared by the Friendly Sew and Stitchers Extension Club. For more information write or stop at your local Cooperative Extension Office."

Print the address and town of the Extension office below the second line. And display the Extension seal some place in the exhibit.

The credit lines and the Extension seal should not have a prominent place in the exhibit, and should not detract from it.

Lettering in script style is very effective. If you can squeeze out the funds, hire a commercial artist. Nothing ruins your overall effect more than shaky, poorly proportioned letters. But, if your budget won't stand the expense, then use the cutout letters or stencil guides or your own handwriting in large, readable size.

For your main caption, advertising agencies recommend letters at least $2\frac{1}{2}$" high.

The advice of window trimmers and sign painters often will aid in improving your plans. They can contribute helpful information on captions, title signs, placards, charts, and similar explanatory material.

All items not immediately self-explanatory should be carefully labeled.

5

Captions are vital in displaying objects. The lettering should be large enough to insure legibility. Here is a rule of thumb for the size of letters:

Distance in feet from viewer to written material	Minimum size
3	$\frac{1}{4}$"
8	$\frac{1}{2}$"
15	1"
25	$1\frac{3}{4}$"
50	$2\frac{1}{2}$"

Use of Objects

Clutter is the worst enemy of an exhibit. The fewer elements in your exhibit the better.

The patterns and contrasts you can achieve with two or three well related objects have more dramatic impact than you can get from many objects.

A pattern is a valuable ally. If you have three things to show, try displaying them at different heights. If you display several objects, pick out the most important one and build the design so that the subordinate objects focus the visitors' eyes on the important one. This is where your risers play an important part in your exhibit.

The setting can make all the difference in dramatizing objects. Put them in shadow box; throw a spotlight on one; lean the objects against an easel or large wheel; hang objects from a clothesline; or build a picket fence around them.

Whatever you do, make sure the setting is in keeping or appropriate with the nature of the exhibit. Don't just show them--show them off!

ADD SPARKLE

You can control the whole mode of your display or exhibit by colors. Decide first whether you want an effect of dignity, crispness, gaiety, or nostalgia. Then build your color scheme around that atmosphere.

You have six main colors--red, blue, yellow, orange, green, and violet. To help you see their relationship look at their order on the color wheel.

By mixing the colors you get different hues. For instance, red is a color while pink, rose, and ruby are hues of that color.

Black and white (neutrals) can be effectively used in an exhibit.

Warm Colors or Cool Colors?

Red, yellow, and orange are known as warm colors because they reflect warmth. They add pep and a warm glow to your exhibit. If used in large amounts they can also make your exhibit look smaller because warm colors advance toward the viewer.

Blue, green, and violet are known as cool colors. The sky, grass, a lake--they give the feeling of coolness. Cool colors can create that effect in your exhibit. If you have a real small booth, the cool colors will make your exhibit appear larger or more spacious, because they are receding colors. Cool colors, when used in large amounts in the exhibit, will create a more restful atmosphere.

Colors Are Used Together

When you've chosen one main color and hues, then decide how to use the colors together. When you put colors together in an exhibit, you create a color scheme. It's much easier to plan a good color scheme if you have a guide.

First Guide--Use of one color. One color can be exciting, but you can vary that one color by using some of its tints and shades. For instance, the one color could be green with light green, medium green, and dark green.

Second Guide--Neighboring colors. Any three colors together on the color wheel get along fine in a color scheme. For example, yellow, yellow-green, and green; or blue, blue-violet, and violet. If you use this color scheme, allow for some "play" in your colors--some light, some dark, some bright, and some dull--to avoid monotony

Third Guide--Complementary colors. Any two colors directly across from one another on the color wheel are complementary. They are referred to as complementary because one color complements the other; that is, red makes green look greener, green makes red look redder. Complementary colors are not used in lettering. That is, red lettering is not used on green background. These colors can be used in the color scheme for your exhibit, but you'll have to make one darker and duller for real interest. Cherry red against a dark forest green is an example. Soft yellow against deep violet, or red-orange against

dull blue-green are other combinations. Plan not to use both colors in equal amounts. You'll want more of the dull color and less of the bright. These particular schemes of colors look best in a large exhibit space.

Fourth Guide--Neutral plus an accent. Neutrals are black, white, grey, or any neutrals very close to them like buff, beige, cream, and oyster white. If you use one or more of these neutrals and add one bright color--red, for example--you would have an interesting, modern color scheme.

Fifth Guide--Triads. Cut out a triangle and place it on top of your color wheel. Notice the three colors to which the triangle points. Turn it to point to three other colors. Each three colors the triangle points to form a triad. You can use these three colors as a basis for a color scheme. Select a subdued color for the largest area, a slightly brighter color for the next largest area, and the brightest color for the smallest area in the exhibit.

Colors used to attract, such as red, orange, or yellow, might be used on the "hot spot" of your exhibit or for your main message. These are the most conspicuous colors and make a strong impression. The background of your exhibit should be neutral in color, using pastels, light greys, light greens, or pale yellow. These neutrals look well with almost any color mounted on them. A good rule-of-thumb is to use vivid colors sparingly and on small areas; pastel colors on large areas.

Lighting Your Exhibit

Watch lighting in your exhibit; it can play some surprising tricks on your colors. Check your colors under a strong light to see if they wash out. If there is a chance that your exhibit may be under flourescent lighting, make sure that you know exactly how your colors behave under those lights.

A DEMONSTRATION BOOTH IS EXCELLENT

Most spectators will spend more time at a demonstration exhibit. Research indicates patrons will spend up to 10 minutes at such a booth. If you use a demonstration, have it timed carefully to fit into that amount of time, still leaving a margin of minutes for questions.

An exhibit is ideal for a demonstration of equipment. Have a specialist, leader, or an agent present at specified times to demonstrate equipment and answer questions

from the audience. An even more effective method is to have the demonstrator ask members of the audience to use the equipment after it has been demonstrated.

ATTENDANTS AT EXHIBIT

At your booth or exhibit you should have trained attendants as hosts. For a county extension exhibit one of the agents should be at the booth at all times. If you use local leaders as attendants, they should be familiar with the elements of the exhibit and should have lists of circulars available from the county extension office.

Your booth should provide a bench or a chair for your patrons to sit and rest a few minutes.

WARNING

Check the fire laws and rules regarding materials, lighting, and equipment. These regulations are rigidly enforced and your whole exhibit may be useless if it does not conform to rules.

USEFUL MATERIALS

Seamless papers
Wallpaper
Corrugated paper
Heavy cardboard
Discarded mattress boxes (From these you can make your background.)
Fabrics
Masking tape
Stapling gun
Pins
Tacks
Lettering guides
Felt-point and other types of lettering pens and pencils
Yardsticks
Brass paper fasteners
Scissors
Rubber cement or glue
Waterpaints such as Kemtone (These are non-flammable and therefore excellent for indoor use.)
Lumber
Hammer
Nails
Saw
Extra light bulbs and plugs
Spotlights
Extension cords

You'll want to collect this material before you start to build your booth.

SUGGESTED EXHIBIT SCORE CARD

The exhibit:	Points
1. Effective message (caption or title sign):	15

   Short, catchy, appropriate, well worded to cover subject
   and suggest action when appropriate.

2. Draws attention:	20

   An attention getter that <u>reinforces</u> the main idea.

   Something unusual--motion, light, design, and/or color.

3. Holds attention:	25

   Tells a coherent, clearcut, one-idea message quickly.
   Arouses curiosity about the subject. Has systematic ar-
   rangement, easy to follow to tell the story. An attendant to
   answer questions.

4. Sells Extension:	15

   Appeals to such motives as desire and need for profit,
   health, comfort, convenience, recreation, and the saving
   of time and energy.

5. Tells where assistance and more information are available.	5
6. Presents pleasing appearance.	10
7. Uses explanatory material effectively:	10

   Material brief and easy to read. Size of charts, maps,
   placards and letters adequate (see letter size, page 6).

TOTAL POINTS	100

Issued   March 1960.

GPO 889245

DEVICES FOR LOCATING COLOR HARMONIES

RELATED OR
ANALAGOUS

B

ONE HUE
OR
MONOCHROMATIC

A

CONTRASTING
OR
SPLIT
COMPLEMENTARY

E

CONTRASTING OR
DOUBLE
COMPLEMENTARY

D

CONTRASTING
OR
COMPLEMENTARY

C

TRIADIC

F
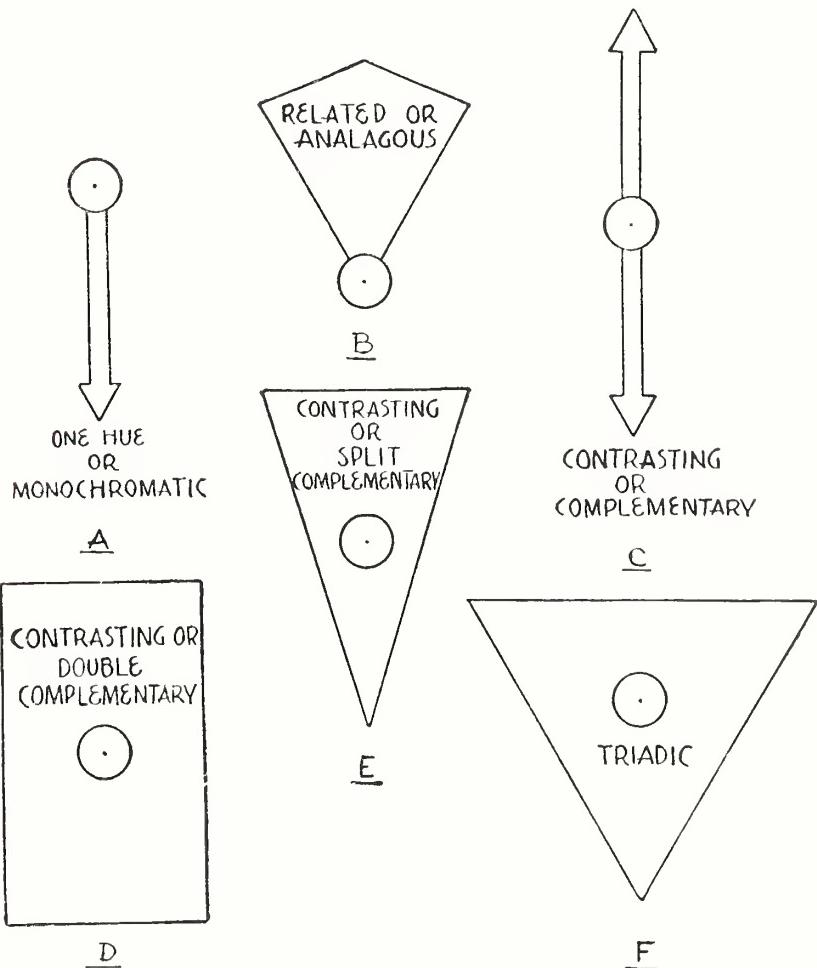
A STUDY OF GRAPH
COMPREHENSION DIFFICULTIES

● HUGH M. CULBERTSON
● RICHARD D. POWERS

This study was made to determine how much certain factors of graph design contribute to ease of graph comprehension, and was undertaken as an M.S. degree project by Mr. Cul- *bertson. The authors are on the faculty of the Agricultural Journalism Department of the University of Wisconsin.*

POTENTIAL graph users must often choose from a variety of ways to present data graphically for nontechnical readers. They almost always choose on the basis of tradition or advice given in books, as there is very little research evidence to go on.

This paper reports an effort to investigate how much certain graph variables contribute to graph difficulty. The question discussed is "What characteristics of graphs make for ease or difficulty of comprehension?" and not how graphs compare with other means of presenting numerical data. The study was part of a larger investigation conducted in cooperation with the Office of Information, U. S. Department of Agriculture,* which uses many graphs in communicating numerical information in publications.

METHOD

Twenty-five graphs were designed, all based on the same model graph, but changed in various ways to disguise the similarity and to manipulate the graph variables being investigated. Each graph

contained four units, and each unit was split into three elements.

An *element* is defined as the smallest part of a graph—a segment of a bar, one of a group of bars, a segment of a circle, or a line on a grouped line graph.

A *unit* is a group of three graph elements—three segments of a segmented bar, a group of three grouped bars, one circle, the top line of a surface chart, or the total of three lines at any point on a grouped line graph. (For several examples, see the models on pages 101 through 103 of this article.)

Each graph was presented with a series of four to seven multiple-choice questions. The questions asked for a standard set of "interpretive operations"—i.e., evaluations of or comparisons between elements of the graph. Graph elements compared and judged were of the same size and in about the same location for all graphs presented.

These interpretive operations, cast in the terms of each graph, asked the respondent to:

1. Estimate relative length of four units.
2. Estimate the quantity of an element originating at the zero line of the graph.
3. Estimate the quantity of an element originating at some point other than zero on segmented graphs.
4. Judge the relative length of two different elements within the same unit.
5. Judge the relative length of two differently labelled or keyed elements in different units.
6. Judge the relative length of two similarly labelled or keyed elements in different units.
7. Judge the difference between two differently labelled or keyed elements in different units.

About 100 students in the University of Wisconsin Farm Short Course were given the test of 25 graphs. They completed the test easily in two 50-minute periods, scoring an average of 80 percent correct answers. Practically all the students had recently completed high school, were between 18 and 24 years of age, and were engaged in farming as an occupation.

Conclusions drawn from tests of the Short Course students were verified by testing about 250 students in Wisconsin high schools.

The graphs contained fictitious data on agricultural production, demography, and other areas related to agriculture. The data were kept as plausible as possible, but students were warned to answer from the graphs and not from prior knowledge. True

data were not used because of the need to keep comparisons stand-ard for all graphs in the study.

The 25 graphs allowed two or more controlled comparisons on each of 11 graph variables:

- A. Identification of elements (see Figure I for numbers 1 and 2):
    1. By labels
    2. By keys
    3. By pictorial symbols
- B. Presentation of quantities (see Figure I):
    1. By figures-on-elements
    2. By means of a grid on graph axis
- C. Bars or line graphs (see Figure II):
    1. Discrete bars
    2. Continuous lines
- D. Two types of comparison within a graph unit (see Figure II):
    1. "Segmented" arrangement for presenting constituent parts of a total. Some elements of this graph do not originate from the zero base line.
    2. "Grouped" arrangement for presenting constituent parts of a total. All elements of this graph originate at the zero base line.
- E. Two ways of presenting parts of a whole:
    1. Pie charts for presenting percentages
    2. Segmented bars for presenting percentages

Each comparison involved two graphs that differed only in one variable. Thus it was possible to compare graphs with keys and graphs with labels as to ease of comprehension while the other variables (grid or figures-on-elements, line or bar form, et cetera) remained constant. The comparisons were made by t-tests of differ-ences between mean scores of each group.

The Farm Short Course students also took the Differential Aptitude Tests (Psychological Corporation, New York) for verbal reasoning ability, abstract reasoning ability, and numerical ability. These were correlated with scores for general graph comprehension ability (percentage of correct answers to questions on all 25 graphs) and with the number of correct answers for each graph. IQ percentile scores for 140 of the high school students were also correlated with general graph comprehension scores.

Bar Graphs or Line Graphs?

Six pairs of graphs were designed to compare line graphs and bar graphs. Both horizontal and vertical bar graphs surpassed line graphs under the conditions of this study.

The four sets of subjects (one group of 94 Short Course students and three groups of 70 to 90 high school students each) provided 24 comparisons between lines and bars. All gave a higher mean score on the bar graph—22 by amounts which were significant at 95 percent confidence. See Table 1.

TABLE 1.—NUMBER OF COMPARISONS FAVORING LINE, BAR GRAPHS

	Short Course (N = 94)		*1st High School* (N = 67)		*2nd High School* (N = 89)		*3rd High School* (N = 92)	
	Favor Line	*Favor Bar*	*Favor Line*	*Favor Bar*	*Favor Line*	*Favor Bar*	*Favor Line*	*Favor Bar*
Total	0	6	0	6	0	6	0	6
99% Significant	0	1	0	4	0	5	0	3
95% Significant	0	5	0	2	0	0	0	2

Figures Given or Grid Lines Used?

In seven cases, one graph had values written on each element while an otherwise similar graph had grid lines from which readers judged quantities. For all four groups of subjects, five of the seven graph pairs gave consistently higher mean scores with figures-on-elements than with grids.

Separate analysis of the four groups of subjects yielded 28 comparisons between grids and figures-on-elements. A total of 20 gave higher scores for graphs with figures-on-elements—11 significantly at the 95 percent level of confidence. Seven differences favored grids, but only three of these were significant. In one comparison, there was no difference between the graph with figures and the graph with a grid. See Table 2.

Labels or Keys?

Results on seven of eight graph pairs indicated that labels are generally easier to read than keys. Labelled graphs had identifying words on each element. Keyed graphs identified elements through a cross-hatched key to the right of or below the graph.

TABLE 2.—NUMBER OF COMPARISONS FAVORING GRIDS, FIGURES-ON-ELEMENTS

	Short Course		1st High School		2nd High School		3rd High School	
	Grid	Figures-on-Elements	Grid	Figures-on-Elements	Grid	Figures-on-Elements	Grid	Figures-on-Elements
Total	2	5	2	5	2	5	1	5
99% Signif.	1	2	0	0	0	0	1	0
95% Signif.	0	1	0	2	1	3	0	3

Twenty-two comparisons gave higher mean scores for labelled graphs—seven significantly at the 95 percent level of confidence and one at the 99 percent level. See Table 3. Eight comparisons favored keys—including two that were significant.

Only one pair of graphs gave consistently higher mean scores for the keyed graph than for the labelled graph. These two graphs had figures-on-elements and were grouped. It seems likely that keys might work fairly well with such graphs, as the key is the only necessary reference point outside of any element.
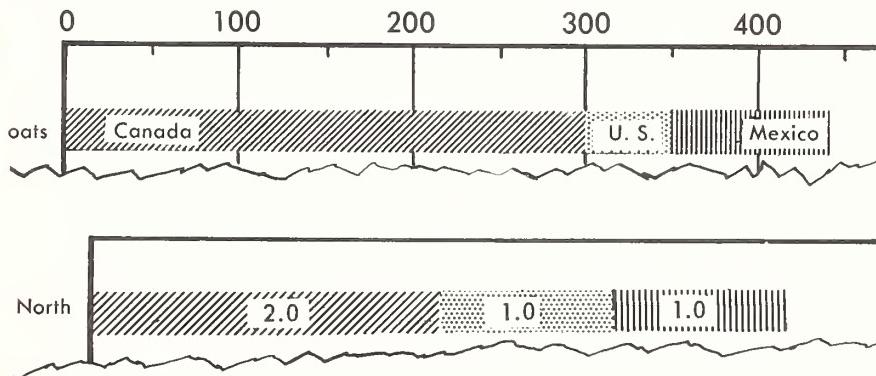
Top: Bar elements identified with a label, but reference to the grid at the top is needed for determination of quantities represented.

Bottom: Bar elements must be identified by reference to the key below but quantities are noted by figures on the element. In these graphs the entire bar is the graph *unit*, while the differently shaded segments are graph *elements*.

Figure I

Graph Variables and Their Presentation Compared
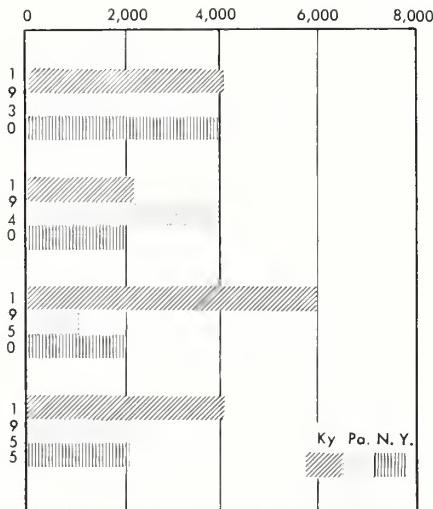
At left is a grouped bar graph. This graph shows horizontal format.

Below is a grouped line graph in which elements are the area between the base line and each graph line, and the graph units are the totals of the three elements at any point on the graph's horizontal axis.
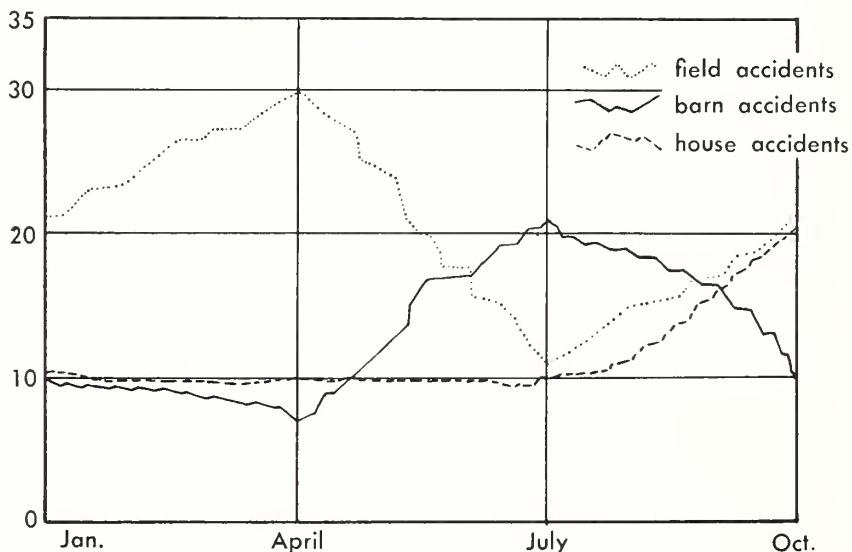
Figure II

Factors of Bar and Line Graphs Compared

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At right is a segmented bar graph. This graph shows vertical format in contrast to the horizontal format on the opposite page.
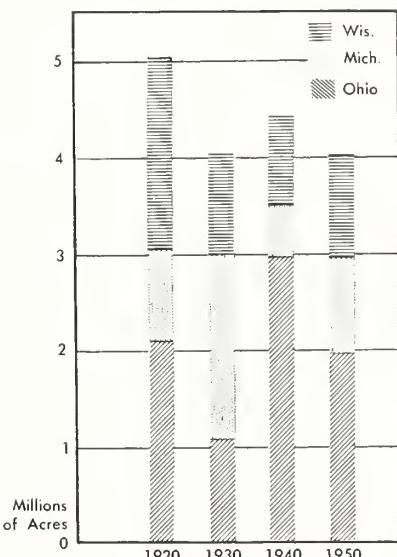
Below is a segmented line graph (surface chart) in which differently shaded portions are the graph elements, while the distance from the base line to the top graph line is the graph unit.
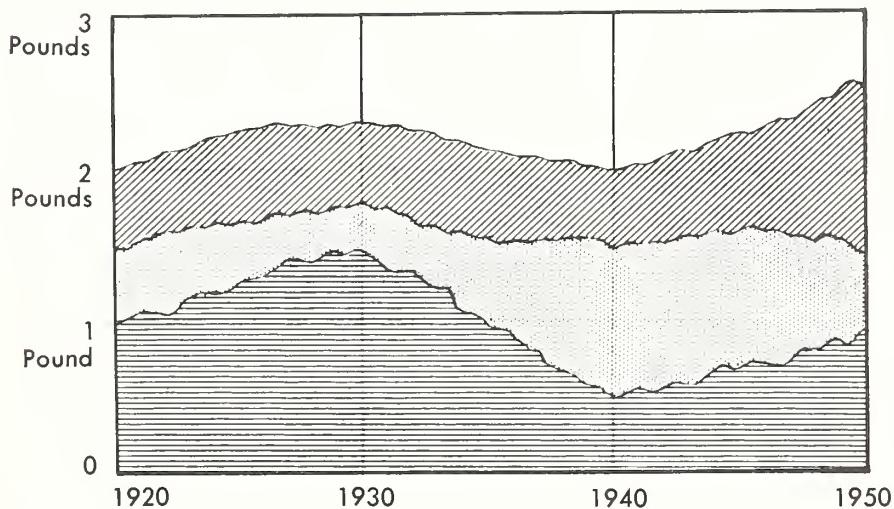
Figure II (Continued)

Factors of Bar and Line Graphs Compared

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TABLE 3.—NUMBER OF COMPARISONS FAVORING LABEL, KEY

	Short Course		1st High School		2nd High School		3rd High School	
	Label	Key	Label	Key	Label	Key	Label	Key
Total	7	1	5	2	5	2	5	3
99% Signif.	0	0	0	0	0	0	1	0
95% Signif.	1	0	1	1	3	0	2	1

Word Labels or Pictorial Symbols?

Two graph pairs differed only in that one graph identified elements through a label on each element while the second graph identified elements through outline symbols (i.e., a drawing of a tractor or cow). Symbols and labels gave near equal mean scores, as is shown in Table 4. Comparisons involved both horizontal bar-type and circle graphs.

TABLE 4.—NUMBER OF COMPARISONS FAVORING SYMBOL, LABEL

	Short Course		1st High School		2nd High School		3rd High School	
	Symbol	Label	Symbol	Label	Symbol	Label	Symbol	Label
Total	0	0	1	1	0	0	0	0
99% Signif.	0	0	0	0	0	0	0	0
95% Signif.	0	0	0	0	0	0	0	0

Pictorial Symbols or a "Key"?

Two pairs of graphs were designed to compare pictorial symbols and keys. Both pairs solidly favored symbols over keys. Eight comparisons were provided, seven giving higher mean scores for symbol-type graphs than for keyed graphs. No comparisons favored keys over symbols. See Table 5.

In summary, the data suggest that symbols and labels are about equally suitable for identifying graph elements. Both seemed to be easier to comprehend than keys under the conditions of this study.

TABLE 5.—NUMBER OF COMPARISONS FAVORING SYMBOL, KEY

	Short Course		1st High School		2nd High School		3rd High School	
	Symbol	Key	Symbol	Key	Symbol	Key	Symbol	Key
Total	2	0	1	0	2	0	2	0
99% Signif.	0	0	0	0	1	0	0	0
95% Signif.	2	0	1	0	0	0	1	0

Horizontal or Vertical Bars?

Four pairs of graphs were designed to compare horizontal bars with vertical bars. Eight t-test comparisons favored the vertical format—three significantly at 95 percent confidence. As Table 6 shows, five comparisons favored horizontal bars—two significantly. Three comparisons showed no difference between vertical and horizontal format.

The data suggest that vertical bars may be slightly better than horizontal bars with some types of graphs. But the evidence is not conclusive. Horizontal bars give more room for figures and labels on or near elements—a practical factor which graph users must consider because tests strongly favor these two variables.

TABLE 6.—NUMBER OF COMPARISONS FAVORING HORIZONTAL, VERTICAL

	Short Course		1st High School		2nd High School		3rd High School	
	Hori-zontal	Ver-tical	Hori-zontal	Ver-tical	Hori-zontal	Ver-tical	Hori-zontal	Ver-tical
Total	1	2	2	1	1	2	1	3
99% Signif.	1	1	0	0	0	0	1	0
95% Signif.	0	0	0	1	0	1	0	0

Segmented or Grouped Graphs?

"Grouped" graphs generally gave higher mean scores than "segmented" graphs. Grouped line graphs were clearly better than segmented surface charts (all seven significant differences favored grouped line charts). The grouped format also appeared to be best when bar graphs were tested (by 8 significant differences to 1), though two of the five bar graph pairs used showed no consistent difference between the grouped and segmented formats. See Tables 7 and 8.

TABLE 7.—NUMBER OF COMPARISONS FAVORING SEGMENTED, GROUPED (BAR GRAPHS)

	Short Course		1st High School		2nd High School		3rd High School	
	Segmented	Grouped	Segmented	Grouped	Segmented	Grouped	Segmented	Grouped
Total	2	3	0	4	2	3	1	4
99% Sig.	1	1	0	2	0	1	0	2
95% Sig.	0	0	0	0	0	1	0	1

TABLE 8.—NUMBER OF COMPARISONS FAVORING SEGMENTED,
GROUPED (LINE GRAPHS)

	Short Course		1st High School		2nd High School		3rd High School	
	Segmented	Grouped	Segmented	Grouped	Segmented	Grouped	Segmented	Grouped
Total	0	2	0	2	0	2	0	1
99% Sig.	0	2	0	0	0	0	0	1
95% Sig.	0	0	0	1	0	2	0	0

Analysis of two graph pairs showed no near significant difference between multi-circle graphs and segmented bars for percentage data.

*Correlating Intelligence and Differential Aptitude Scores
with Graph Reading Scores*

Pearsonian correlation showed that differential aptitude scores on verbal reasoning, numerical reasoning, and abstract reasoning each correlated moderately with graph comprehension ability as measured by the total number of correct answers to the entire graph test. Examine Table 9.

TABLE 9.—RELATIONSHIP OF THREE DIFFERENTIAL APTITUDES
TO GRAPH READING ABILITY

Ability	Mean	r*	σ (ability)	No. of Subjects
Numerical Reasoning	51.0	.551	18.8	92
Abstract Reasoning	54.5	.554	21.5	99
Verbal Reasoning	51.1	.557	17.1	107
Hemnon-Nelson IQ (Wisconsin percentile rank)	42.0	.427	27.3	141
Graph Comprehension	80.2	—	—	250

* Each r value relates the stated aptitude or IQ test score to the total graph comprehension score. An r value of .25 and above is highly significantly above zero.

This study and other correlation analyses involving Differential Aptitude Tests show that:

1. Each of the three aptitudes tested is highly significantly related to graph reading ability.
2. All three aptitudes relate more closely to word reading than to graph reading (8).

3. The test score for any of the three aptitudes is related to the general graph comprehension score in about the same degree as it is related to each of the other aptitude test scores.

Correlation analysis was used to measure the relationship between scores on individual graphs and scores on three Differential Aptitude Tests. No single variable (i.e., lines versus bars or keys versus labels) consistently influenced the correlation between graph reading ability and aptitude test scores.

However, graphs with three or four "difficult" traits (segmented, key, line, or grid) often correlated significantly more closely with each aptitude than did a graph that had several "easy" traits. This could mean that certain graph traits have a cumulative influence on graph difficulty.

<center>DISCUSSION</center>

Graph Variables

1. Bar graphs proved convincingly easier to read than line graphs, partly perhaps because bar graphs clearly connect the horizontal axis with each abscissa value to be read. Line graphs do not clearly pinpoint abscissa values; so picking out points on a line might make comprehension difficult.

2. Surface charts (segmented line graphs) proved very difficult. Surface charts are used widely—possibly because they are attractive and easily constructed.

This study required noting and comparing specific quantities. It did not present trend or progress data—the traditional function of line graphs. Even for this function, however, the authors feel that trend-type bar graphs would be more easily understood than line graphs. Such graphs would simply show the year of upturn, the year of downturn, and selected years in between.

3. The study suggests that each graph element should be identified by a label on or near the element. A cross-hatched key for element identification may add to a graph's difficulty because it requires associating word meanings through visual patterns.

4. Graphs with identifying symbols appeared to be about as easy to read as those with labels. Both the symbol and label proved better than use of a key. The current study used symbols to identify elements and not as counting devices (e.g., one drawing of a cow refers to 10,000 head). Counting symbols present a new set of interpretive problems.

Future studies might investigate the supposed concreteness of symbols. We need to know whether a symbol helps understanding because it *looks like* its referent (while words supposedly are more abstract), or whether use of a pictorial symbol simply heightens interest, or whether it serves some other purpose.

5. Graphs with figures placed on each element appeared generally more informative than those in which the reader estimates quantity by referring to a grid. Grid lines force the reader to: (a) locate the beginning and end of an element, (b) follow the nearest grid line to the quantitative axis, and (c) read the corresponding value on the quantitative axis. Obviously this three-step process is more complicated than reading a figure right on each element, and the difference in difficulty is reflected in test scores.

6. Comparison of segmented and grouped graphs favored the grouped format. Results were more conclusive when line graphs were tested than when bar graphs were tested. The reader's interpretive operation seems especially important in choosing between the grouped and segmented format. This study has emphasized evaluation of elements more than evaluation of units, as presentation of specific elements is the only reason for using a complex graph (with more than one element per unit). Suitability of each graph variable for each interpretive operation was not explored in this project.

7. Circle graphs or segmented 100-percent bar graphs were about equally well suited for showing percentage data in this study. Other comparisons of circles and segmented bars have given rather contradictory results (2, 3, 4, 6).

8. Vertical bars appeared slightly better than horizontal bars with some types of graphs (5). But evidence was not conclusive. The horizontal format is advantageous because it allows placing of labels and figures on or near elements.

Relating Mental Capacity to Graph Reading Ability

This study indicates that Differential Aptitude Tests and IQ scores both correlate moderately with graph comprehension ability. Apparently neither measure can serve to predict differences in graph scores or even go very far toward explaining such differences. Strickland (7) reached a similar conclusion regarding IQ in a study of elementary school children.

Investigation of perception and basic mental operations may be basic to further studies relating intelligence to graph reading.

These operations include associating word meaning with visual patterns, judging distances between lines (1), and judging relative lengths or widths (5).

SUMMARY

This study sought to determine how much certain factors of graph design contribute to ease of graph comprehension. Tests were given to about 100 vocational Farm Short Course students at the University of Wisconsin and to about 250 high school students in Wisconsin. Nine different choices in graph design were investigated. Differential Aptitude Test scores by the Short Course subjects were correlated with general graph comprehension scores and with scores on each group. Intelligence test scores were substituted for D.A.T. scores in the high school analysis.

• Both horizontal and vertical bar graphs proved better than line graphs for evaluating and comparing specific quantities.

• Quantities written on each element gave higher test scores than did grid lines. Reading grids apparently involves mentally connecting an abscissa or ordinate value to the corresponding point on the quantitative axis. Future study may show that grids work well for certain interpretive operations.

• Labels on each element gave higher mean scores than did cross-hatched keys for element identification.

• Symbols for identifying graph elements were easier to read than keys and about equally as good as labels.

• Grouped line graphs (with each element originating from the zero base line) appeared to be somewhat easier to read than segmented line graphs (surface charts). However, firm conclusions on segmented and grouped graphs will require study of mental interpretive operations.

• Circle graphs (pie charts with four circles) and segmented bar graphs worked about equally well for percentage data.

• Vertical bars appeared to be slightly easier to read than horizontal bars with certain types of graphs. However, horizontal bars had the edge in one type of graph tested. Horizontal bars often work best because they provide room for labels and figures on or near elements.

• Differential Aptitude Test scores in numerical, verbal, and abstract reasoning correlated moderately with graph reading.

Intelligence test scores also correlated moderately with graph reading ability, though the correlation was somewhat lower than the D.A.T. scores. No one variable of graph design caused consistent differences in degree of correlation between graph comprehension ability and aptitude or intelligence.

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USING GRAPHS
more effectively
for economic information

A report on graph research conducted at the University of Wisconsin by Hugh Culbertson, Thomas Flores, Richard Powers, and L. E. Sarbaugh with support from the U. S. Department of Agriculture Office of Information.

Economists and publication editors often have opportunities to use graphs in presenting economic information to the general public.

Graphs that are highly useful when economists talk to economists may not always be best for other readers. But how can we find reliable rules to follow in deciding which of several kinds of graphs will do the best job?

Research in this field has not always yielded useful results. Many books and pamphlets give advice as to the most effective design for graphs, but these sources often contradict one another.

This study was an attempt to answer, as unequivocally as possible, several questions of graph design. The influences of several graph variables were carefully controlled in an experiment which compared various kinds of graphs. Some 600 students in vocational agriculture classes in Wisconsin and Ohio high schools and in the University of Wisconsin Farm Short Course studied the graphs and answered questions about them.

Economists will want to note that in this experiment we were not asking the reader to judge trends or make extrapolations. But we thoroughly tested several kinds of graphs as to the effectiveness with which they helped readers estimate and compare quantities.

Some of the questions we asked called for specific numerical answers (How many cars were sold in Dunn county?). Others asked for comparisons (Was wheat production in Dunn county less than, the same as, or more than in Sand county?). One kind of question asked readers to estimate the size of such differences. A question on most graphs asked the student to estimate a total for several graph elements (How many cars were sold in Dunn county and Sand county combined?).

The phrasing of the questions and the reference points on the graphs were carefully controlled. The graphs were drawn so that several graph pairs could be compared to give evidence as to the influence of each graph variable. The members of each pair were alike except for the difference in the variable being compared. We can supply details of the study design and a complete discussion of the results with a reprint from Audio-Visual Communications Review, Spring 1959.

On the following pages, you'll find a brief popular summary of the results from this study. The graphs used in this publication have been simplified to show only the pertinent feature under discussion. Graphs used in the actual testing were more complex.

Four changes that significantly impro

1. Use labels on elements instead of a key system

Not Recommended   *Recommended*
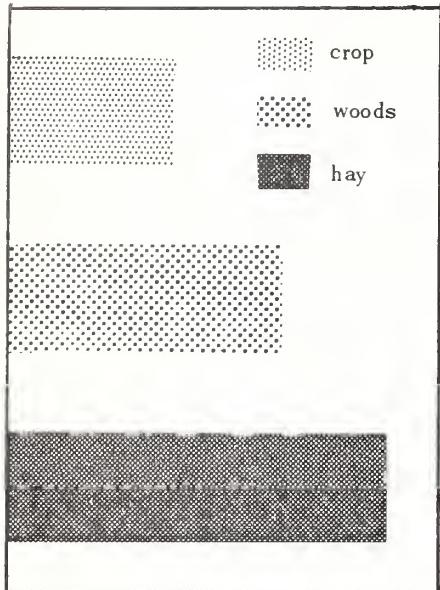
When the reader had to refer to a key, the graph proved much more difficult than when each bar was identified by a label or symbol directly on it.

This improvement is relatively easy to make in most graphs.
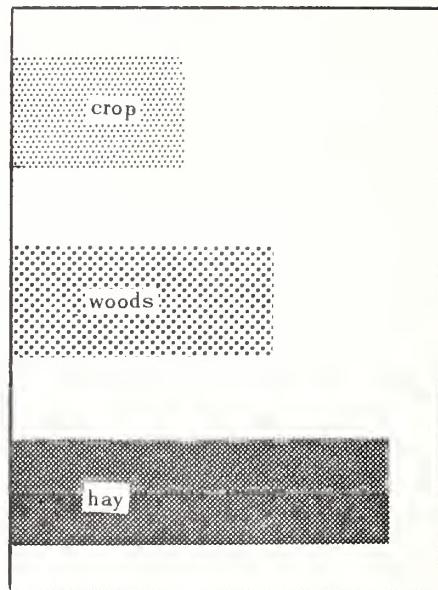
2. Place figures on elements instead of using a grid

Not Recommended   *Recommended*
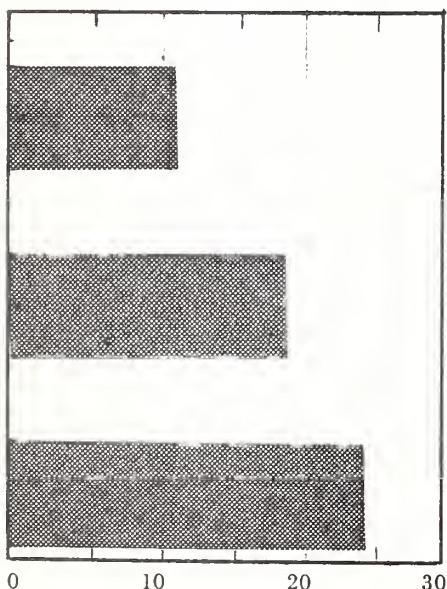
Graphs in which the reader had to refer to a grid for numerical quantities were much more difficult than those which had numbers printed directly on the bars.

This improvement is not feasible for line graphs (curves). It is easy to make with bar graphs, and it is the only recourse with circle graphs (pie charts).
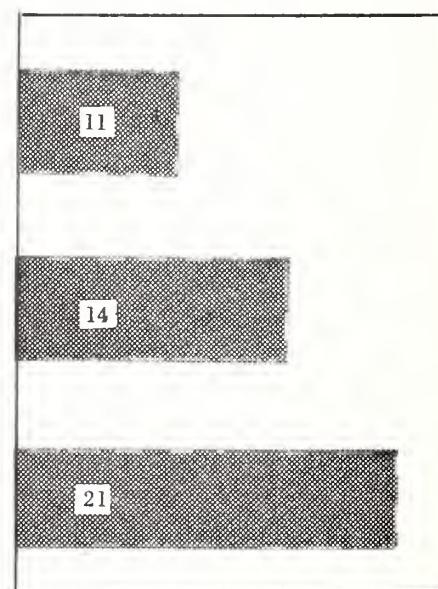
3. Use segmented bars rather than surface charts

Not Recommended   *Recommended*
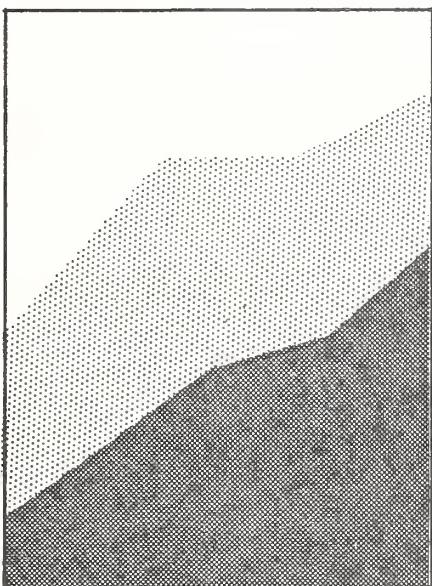
The surface chart on the left is easy to draw, but of all the graphs tested it was the hardest for readers to use in estimating or comparing quantities. Unless the full details of the trend are required, comparisons expressed in separate bars permit much better comprehension.

Only one of the two elements in both graphs originates at the baseline of the graph. This makes it hard to estimate quantities for the upper element in these "segmented" graphs. An ordinary curve or line graph (see comparison no. 4 below) is easier than the surface chart, and a "grouped bar" graph (below, right) is even easier for most operations.
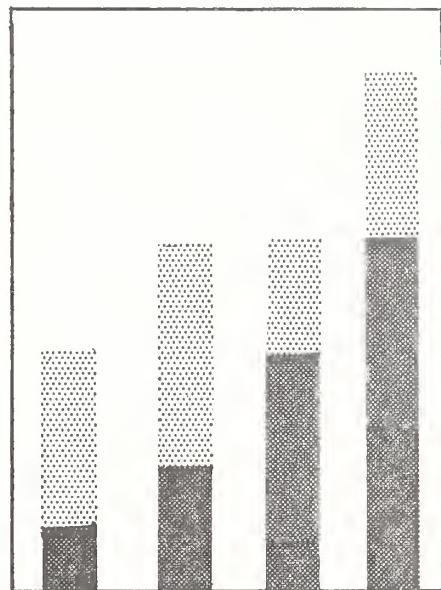
4. Use grouped bars instead of line graphs

Not Recommended   *Recommended*
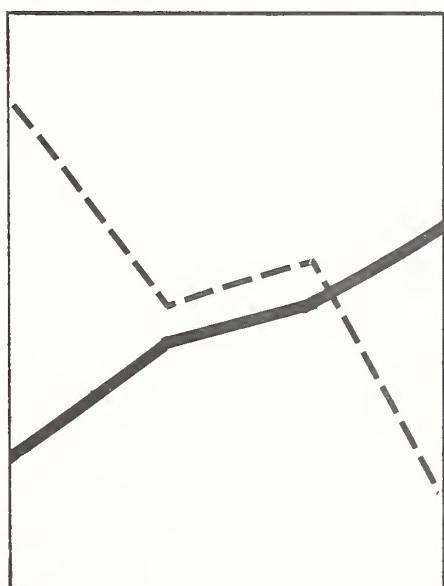
For estimating or comparing quantities the line chart (left) was much less satisfactory than the grouped bar chart on the right. The line chart was better than the surface chart above, probably because all of its elements start from the baseline of the graph.

There was no clear-cut difference between the grouped bar chart (right) and the segmented bar chart (right, above), though the grouped bar chart showed some advantage for many of the questions asked. This again was probably due to the fact that all elements originated at the graph baseline.
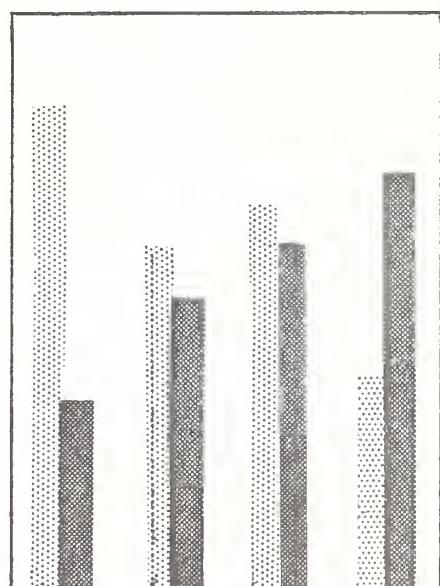
These things made no difference in test scores ...

Pie charts were just as good as percentage bar graphs
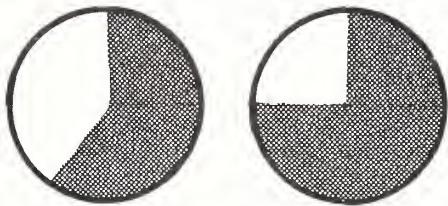
Percentage bar charts and pie charts are about equally suitable for portraying divisions of 100 percent. The bar chart is generally the easier to design.
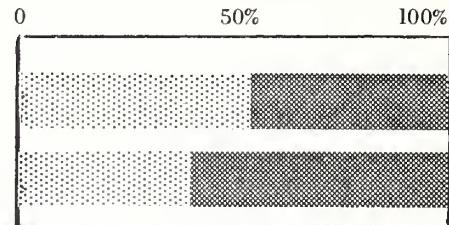
Vertical bars were just as good as horizontal bars
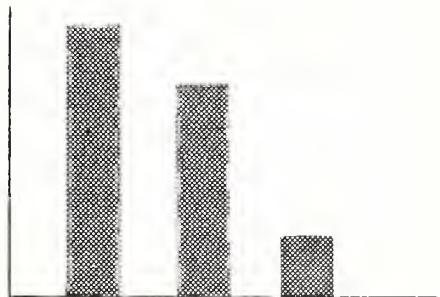
Bars can be placed either horizontally or vertically with no significant difference in comprehension. However, a horizontal bar chart has the advantage of allowing more room for labelling each bar with names and figures.
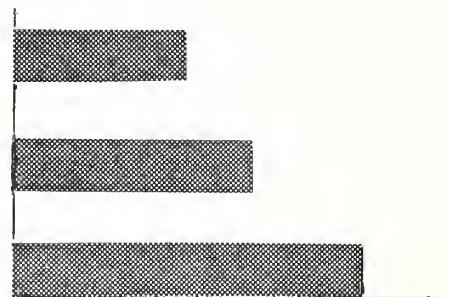
In summary, the research makes these practical suggestions for using graphs most effectively:

1. Where possible, use bar charts rather than line charts and surface charts.
2. Label each bar with figures and identifications (words or symbols).
3. Feel free to use either a vertical or horizontal bar chart, whichever is more convenient on other grounds.
4. Use either a pie chart or a bar chart for presenting percentage breakdowns.

This research project has supplied a few rather firm recommendations for overall effectiveness in communicating through graphs. Because of the way the project was designed, its findings should have wider application than results of some previous tests.

However, much more remains to be done in the area of graph design. This study says that "in general" certain kinds of graphs are best. We are now analyzing our data to learn more about the strengths and weaknesses of various kinds of graphs for specific operations -- for instance, to find out how much gain there is in ease of estimating values and making accurate comparisons if all elements originate at the base line of the graph. This could put graph design on a more rational basis; the author could decide exactly how he expects the reader to use a graph,

and design each graph on the basis of its suitability for its particular purpose.

A big unanswered question has to do with portrayal of trends -- an important function of economic graphs. The operations called for in this study were mostly "static" comparisons. It is probable that most of our conclusions apply also to graphs which show trends, but other variables are involved and a definite answer must await further research.

Beyond these more basic studies, there is need for further work on such matters as titling, color, decorative devices, and aspect. Although decisions on such things are important to authors and editors, study of them requires that some of the more fundamental matters of graph design be thoroughly investigated first.

Comprehension of Graphs

L.E. SARBAUGH
RICHARD POWERS
HUGH CULBERTSON
THOMAS FLORES

PREFACE

The graph comprehension study reported here was conducted by the Agricultural Journalism Department at the University of Wisconsin under a cooperative agreement with the Office of Information of the U. S. Department of Agriculture.

If you are interested in more details of the study than you find in this report, you may refer to two theses completed by graduate students who worked on the study. One is a masters thesis by Hugh M. Culbertson, Department of Agricultural Journalism, University of Wisconsin, 1958; the other is a doctoral dissertation by Thomas G. Flores, Department of Agricultural Journalism, University of Wisconsin, 1959. Culbertson's thesis is available on microfilm from the U. S. Department of Agriculture library; Flores' dissertation is available on microfilm from University Microfilms, Ann Arbor, Michigan, LC Card No. Mic. 59-5766. It contains 193 pages and costs $2.55.

A 4-page summary of the findings of this study is available from the Department of Agricultural Journalism, University of Wisconsin, Madison 6, Wisconsin. It is Department Bulletin 29, "Using Graphs More Effectively for Economic Information," December 1959.

This report is intended for persons who want more details of the study than was provided in the 4-page summary, and for persons who intend to conduct studies of graph comprehension.

CONTENTS

CONTENTS -- Continued

A STUDY OF GRAPH COMPREHENSION

Richard D. Powers, University of Wisconsin and
Lawrence E. Sarbaugh, Office of Information, USDA

SUMMARY

Purpose

In this study, we sought answers to these questions:

1. How do variations in graph design affect the information people get from graphs?

2. What kind of information and how much can people get from different kinds of graphs?

3. What kind of graphs are best for a given purpose?

The ultimate purpose was to determine what can be done to increase the effectiveness of graphs used in publications and other media.

Study design (Chapter II)

The study was designed to provide replicated tests of 12 graph variables and 7 interpretive operations. The graph variables determine what the graphs look like; the interpretive operations are what we expect the reader to do to get the facts the author wanted to convey.

Twenty-five test graphs were developed, each patterned after one model graph. In analyzing the data the graphs were paired so that only one design element differed between the two graphs in the pair.

The people taking the tests were not a random sample of the public, nor of students. They were merely experimental subjects. The primary aim of the study was to test graph variables, not people who read graphs; and enough different groups were used to allow rather firm conclusions about the variables tested.

Findings (Chapter III)

In general, considering all interpretive operations, the study showed that --

1. Bar graphs are easier to understand than line graphs.

2. A grouped format is better than segmented to show quantities.

3. Figures on the elements are easier to understand than grids.

4. Labels to identify graph elements are easier to read than keys.

5. Word labels and pictorial symbols are about equally good for identifying graph elements.

6. Pictorial symbols are better than keys.

7. Horizontal and vertical bars are equally easy to understand.

Recommendations (Chapter IV)

The findings for specific operations resulted in the following recommendations:

1. To compare the relative size of two units, use segmented bar graphs.

1

2. To estimate the value of each element, use grouped bars originating at the zero line.

3. To compare the size of two elements in the same or different units, use a grouped bar graph.

4. To estimate the numerical difference between two elements, use bar graphs with figures on the elements.

5. To combine one or more of the above operations in one graph, use segmented bar graphs with figures on the elements.

Relation of Reader Characteristics to Graph Comprehension (Chapter V)

Intelligence quotient and schooling were related to graph scores. Graph scores increased significantly as schooling increased among low I.Q. respondents. Three aptitudes -- v e r b a l reasoning, numerical reasoning, and abstract reasoning -- also were positively associated with graph scores at a statistically significant level.

Future Work (Chapter VI)

Three types of research are needed to provide a better basis for using graphs to communicate more effectively with the American public. These include:

1. Additional studies of comprehension for graph designs and uses not included in this study.

2. Studies of immediate and delayed recall of information contained in graphs and how graph design may affect recall.

3. Studies of readership of graphs in general and how variations in graph design affect readership.

CHAPTER I -- INTRODUCTION

How this report can help you

It is hoped that this report will do three things for you:

1. Help you see the basis of present practice in graph design and use.

2. Give you some research results that will help you select and construct graphs for publications and other media.

3. Call your attention to other graph research still needed.

Why this study was conducted

Some authors and editors believe that graphs are worthless; others believe that graphs are the best way to present numerical data if the right kind of graph is used. Many in the latter group want to find out what kind of graph is best for a given purpose.

To learn how useful graphs really are, we must answer several questions. Among these are:

1. How do variations in graph design affect the information people get from graphs?

2. What kind of information and how much can people get from different kinds of graphs?

3. What kind of graphs are best for a given purpose?

If we knew the answers to these questions, we would know better how to increase the effectiveness of graphs used in publications and other media.

Recognizing the need for more information about the effectiveness of graphs, the Department of Agricultural Journalism at the University of Wisconsin and the Office of Information of the U.S. Department of Agriculture started a cooperative study of graph comprehension in 1957.

Review of previous work

Near the end of this report is a bibliography of 29 items about graph construction and use. It is not a complete list of all writings about graphs, but it is representative and lists most of the graph research related to this study.

Many writings on graph construction contain recommendations on graph design and use. Relatively few of the recommendations, however, are based on studies of the amount of information people comprehend from different kinds of graphs.

In an effort to achieve uniformity in graph construction, a joint committee on graph standards sponsored by the American Society of Mechanical Engineers under the procedures of the American Standards Association has issued periodic reports. These reports undoubtedly have helped improve the quality of graphs and have encouraged uniformity in design. However, they do not show how accurately or how easily people interpret different kinds of graphs; nor do they show how variations in graph design aid or hinder interpretation by the public.

Perhaps the main concern of communicators is to find symbols and ways to use these symbols that will result in the fewest different interpretations by readers. Previous graph research has considered that problem in graph construction and use. It has attempted to show how different kinds of graphs and graph symbols vary in conveying the information that the author intended. Some of the studies have been well designed, but others have contained so many uncontrolled variables that generalization from the findings is hazardous.

One difficulty in comparing and drawing conclusions from previous studies is that the studies have been conducted under varying conditions with different kinds of subjects (most frequently elementary school students), different sets of variables, and few if any replications. For example, one study may have used 3rd and 4th grade students, while another study on the same phase of graph design used 7th and 8th grade students and a different test design.

An effort was made to improve the research design of this study over that used in previous studies by:

1. Standardizing the graph design and test procedure.

2. Controlling all variables except the one being studied in each pair of graphs that were compared.

3. Providing replications of each comparison through the use of several graph pairs for each variable studied and by using several groups of people to test the graphs.

Two reasons for the popularity of graphs are their versatility and comprehensiveness. There are many variations one can make in designing graphs; and a multitude of numerical facts can be presented in one graph. These may be advantages from the practical standpoint; but they're a disadvantage for anyone doing research on graphs.

It was necessary from the start to specify the things we expected people to understand from the graphs we were testing and to standardize the graphs in various ways. These decisions were made early in the planning because they affected the whole design of the study as well as the questions asked and the conclusions we could draw.

This chapter outlines some of the limitations and specifications, and describes the plan of the study and the methodology used.

It is helpful to consider the study design as the interactions of two things -- (1) certain graph variables, and (2) certain interpretive operations. The graph variables represent different ways of designing graphs; the interpretive operations are what we expect the reader to do to get the intended information from the graphs.

This research is limited in that only 12 of countless graph variables were selected for study. We chose not to study such variables as color, titling, graph aspect ratio, various types of crosshatching, and many others that were suggested as possible research topics. And only 7 interpretive operations were included in the study from among scores of interpretations that people make from graphs.

Our reasons for limiting the study were these:

A. The variables included seemed more basic than others, and information on them is needed before other matters can be studied adequately.

B. Time and funds for the study were limited.

C. It was necessary to limit the length of the test to avoid extreme fatigue or repeated testing sessions.

Definition of Terms

A description of the variables and operations requires definition of two terms -- graph elements and graph units.

An element is defined as the smallest part of a graph -- a segment of a bar, one of a group of bars, a segment of a circle, a line on a grouped line graph, or a segment of a segmented line (surface) chart.

A unit in this study is a group of three graph elements -- three segments of a bar, a group of three grouped bars, one segmented circle, the top line of a segmented line (surface) chart, or the total of three lines at any one point on a grouped line graph.

Parts A, B, and C in figures 1 and 2 are each one element; together they form a unit.

Graph Variables Tested

The graph variables determine what the graph will look like. The variables included in this study were labels, keys, symbols, grids, figures-on-the-elements, bars, lines, segmented format, grouped format, circle (pie) charts, and horizontal vs. vertical bars.

Segmented bar   Grouped bar   Circle graph

FIGURE 1


Surface chart   Grouped line graph
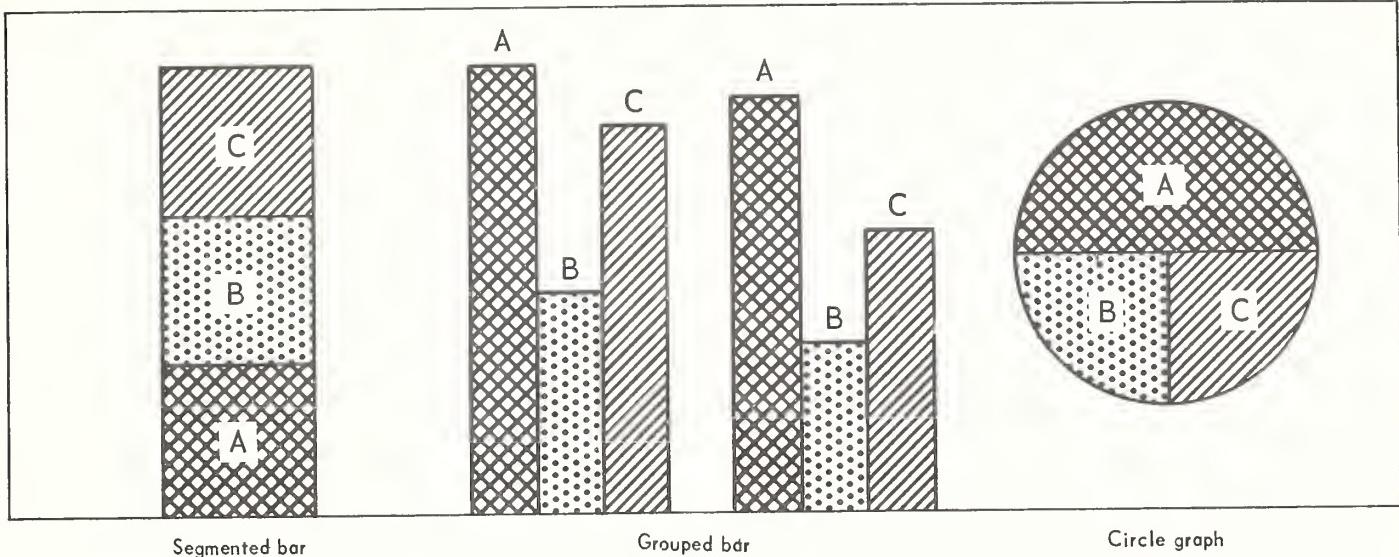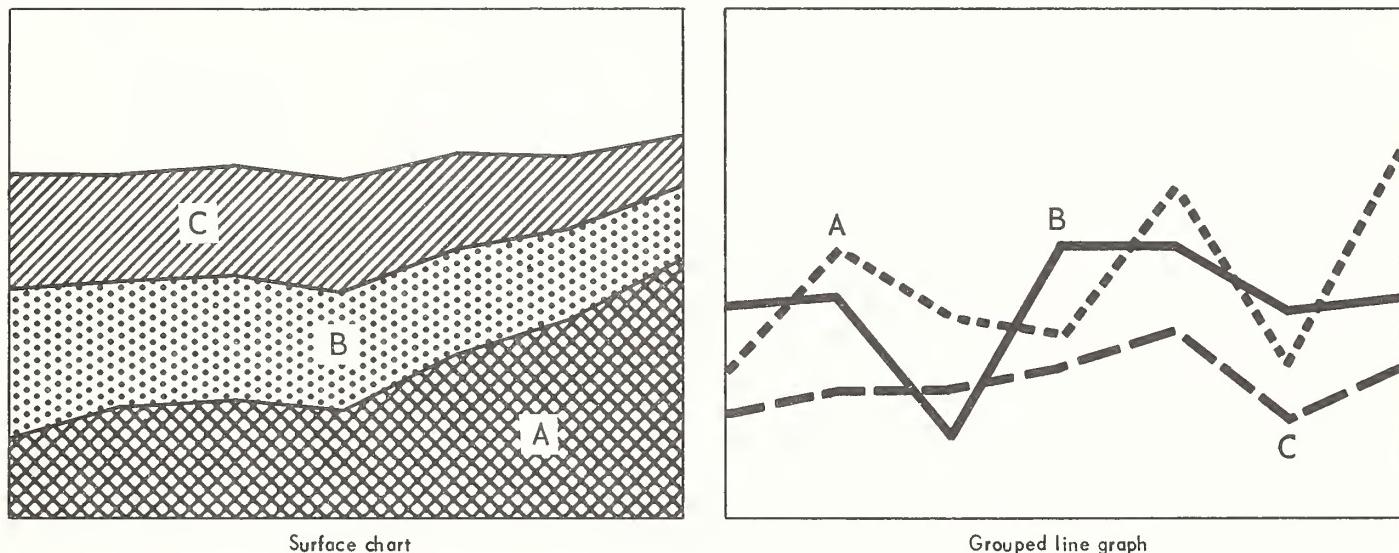
FIGURE 2

Following are the questions asked in relation to the variables studied: (variables are underlined)

1. Which is best to identify elements in a graph: labels, keys, or symbols?

2. Which is better to show size of different elements: a grid with figures along the graph axis, or figures on the elements?

3. Which general form of graph is better: bars or lines?

4. Which is better: segmented or grouped format?

5. Which is better for presenting parts of a whole: circle (pie) charts or segmented bars?

6. Which is better: horizontal bars or vertical bars?

Interpretive Operations

The interpretive operations determined what questions would be asked about each

graph. They are the basis for deciding what information people get from different kinds of graphs. The interpretive operations are as follows:

1. Estimate the relative size of four units - that is, tell which bar or which point on the line represents the largest quantity. (Figure 3)

2. Estimate the value of an element originating at the zero line of a graph. (Figure 4)

3. Estimate the value of an element originating at some point other than zero. (Figure 5)

4. Compare the size of two different elements in the same unit. (Figure 6)

5. Compare the size of two similarly shaded (identified) elements in different units. (Figure 7)

6. Compare the size of two differently shaded (identified) elements in different units. (Figure 8)

7. Estimate the amount of difference between two differently shaded (identified) elements in different units. (Figure 9)

FIGURE 4

How big is A?

FIGURE 5

How big is B?

FIGURE 6

Which is larger, A or C?
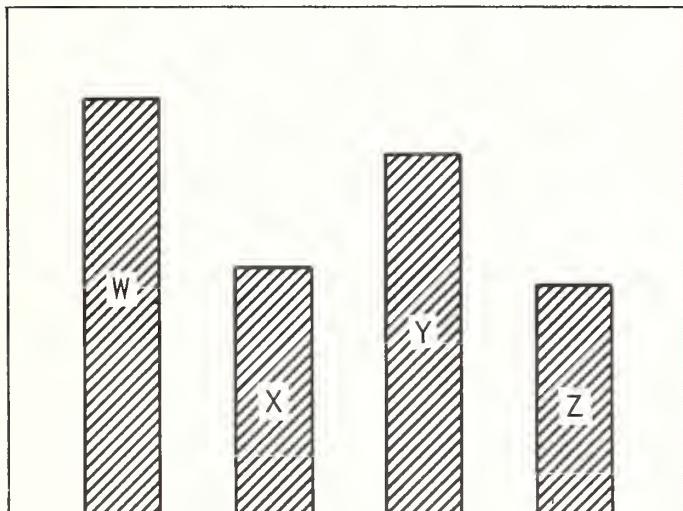
FIGURE 3.--Which is larger -- W, X, Y or Z?
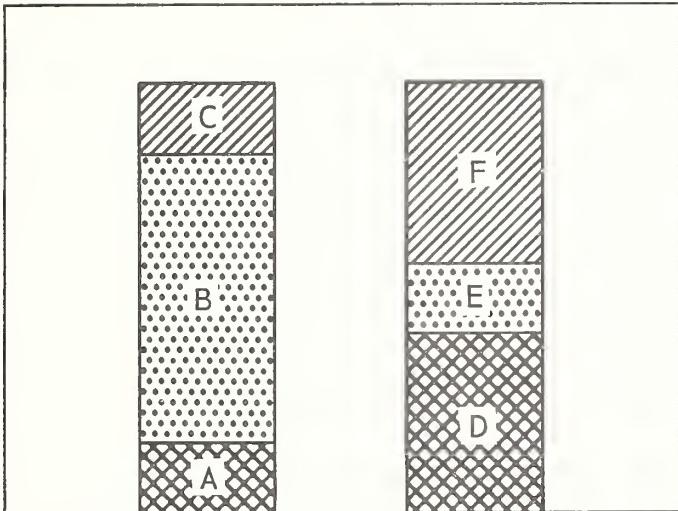
FIGURE 7.--Which is larger, B or E?
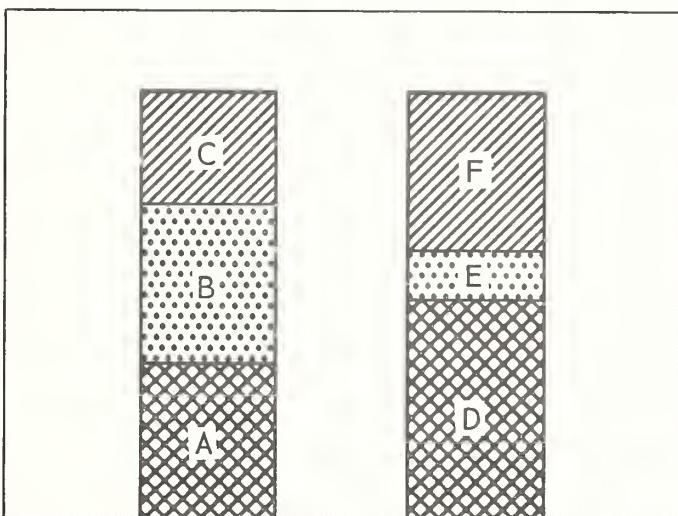
FIGURE 8.--Which is larger, A or F?
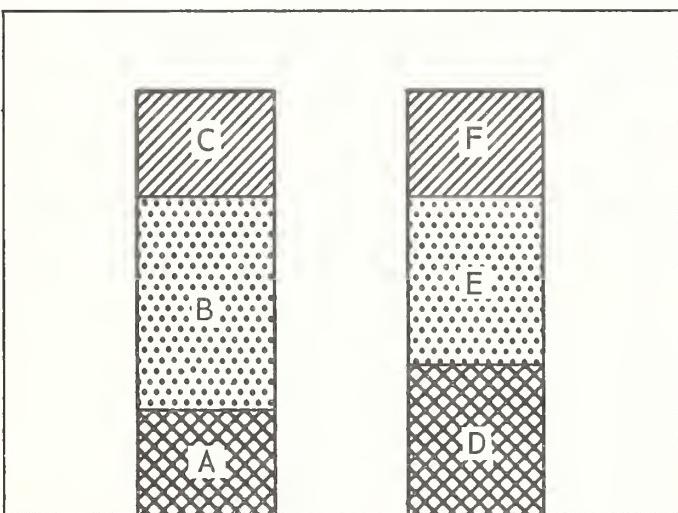
FIGURE 9.--How much larger is B than F?

Design of the Study

The design of this study allows us to make rather definite statements about some matters and rather vague statements about others. Because the graphs were designed so that they could be used in more than one comparison, we could get several comparisons regarding the effect of each variable; and the variable would be exerting its effect in several different "environments" produced by other variables (which were not the same from one comparison to another). This gives: (1) additional evidence of a variable's true influence; and (2) preliminary evidence as to how variables interact in a statistical sense.

For the tests, 25 graphs were designed and carefully screened. Since any of these graphs was likely to be compared with any of the others, most of them had to be based on similar data. Our technique for doing this was to draw one model graph, then decide which elements in the model would be the subjects for the questions that formed the interpretive operations.

Test graphs were drawn from the model graph, disguising the similarity between the two in various ways which neither interfered with the interpretive operations nor introduced additional relevant variables into the graph design.

For instance, sometimes the graphs compared were mirror images; sometimes the front half of the graph was moved to the back. The graphs were on different subjects and had different numbers. But, they were basically the same graph; and the questions asked always referred to the same elements as located on the model graph.

The study design permitted not only replication of graph variables within the test booklets, but replications with the groups

7

of persons tested. Results were considered as respondent group scores, so that each group of persons tested -- University of Wisconsin farm short course, each of three Wisconsin high schools, and Ohio high school students -- provided an additional replication of the results. Thus we could check the consistency of results for a given graph variable among several groups of respondents. (In all, more than 650 students were tested.)

An example of the replications is as follows: If four pairs of graphs were used to study a given graph variable, such as labels vs keys to identify elements, and the tests were administered to five groups of people, we have twenty replications (4 x 5) of the test of this variable.

Test scores were analyzed first for the number of correct answers on all questions asked about each graph. This gave a measure of the general suitability of the graph for all of the interpretive operations. Next, the test scores were analyzed for the number of correct answers for each question for each graph. This latter analysis provided a measure of the suitability of each graph for each of the interpretive operations.

The t-test of difference between means (averages) and between proportions for the various graph pairs was the most common statistical test used. Some correlation analyses and some Chi Square tests were run on some of the data.

Applicability of Results

A few things must be noted as to applicability of results. For one thing, the subjects were not a random sample of people, nor even of high school students. They were merely experimental subjects -- a source of responses to the various types of graphs containing the variables to be studied.

The primary aim of the research was to test graph variables, not people who read graphs. However, this means that the conclusions of the study are merely hypotheses if extended beyond the groups studied. But, they are hypotheses based on much firmer ground than previous ideas.

The experimental design allows rather firm conclusions regarding the comparisons between these graph variables, even though the people taking the test are not representative of the graph-reading population. The conclusions would be made firmer by empirical tests with other segments of the population, of course. But this is a rather simple matter which doesn't call for representative sampling -- an expensive and often impractical procedure.

The appendix of this report contains more details of the study design and procedures and who did what in the study.

CHAPTER III -- WHICH GRAPH DESIGNS ARE GENERALLY BEST?

This chapter reports results of comparing total graph scores for each of the variations in graph design tested in this study. It shows the relative amounts of correct information that those taking the tests got from the different kinds of graphs used.

The comparisons were based on the average scores of pairs of graphs used in tests with 4 groups of respondents. The number of comparisons used in drawing conclusions for each graph trait was the number of pairs of graphs multiplied by the 4 groups of persons.

The average score of all test groups on all graphs was 78 percent correct answers. Scores for the various test groups ranged from 58.6 percent correct to 85.7 percent correct answers. Thus it is apparent that the test groups represented a wide range of graph-reading abilities for the type of graphs used in these tests.

Bars are easier to understand than lines...

Six pairs of graphs provided comparisons between bar and line graphs. All 24 comparisons (6 pairs x 4 groups of people) favored the bar graphs; 22 were statistically significant.

Grouped format generally is better than segmented...(Figures 10-13)

In 8 comparisons of group and segmented line graphs, 7 favored the grouped format and the differences were statistically significant.

With bar graphs, differences between grouped and segmented formats were not as decisive as with line graphs. Scores for 2 of 5 pairs of bar graphs showed no consistent difference between the grouped and segmented format; 2 favored the grouped format and 1 favored the segmented format. However, in the total of 20 comparisons (5 graph pairs x 4 groups) 13 favored grouped bars; 5 favored the segmented format; 2 showed no difference.

The pair of graphs in which the difference in favor of the segmented format was statistically significant was a pair with figures on the elements.

A spot check of 50 test schedules showed a common error in reading segmented graphs was to figure the value of all elements (segments) as though they originated at the zero line. In the segmented test graphs only 1/3 of the elements
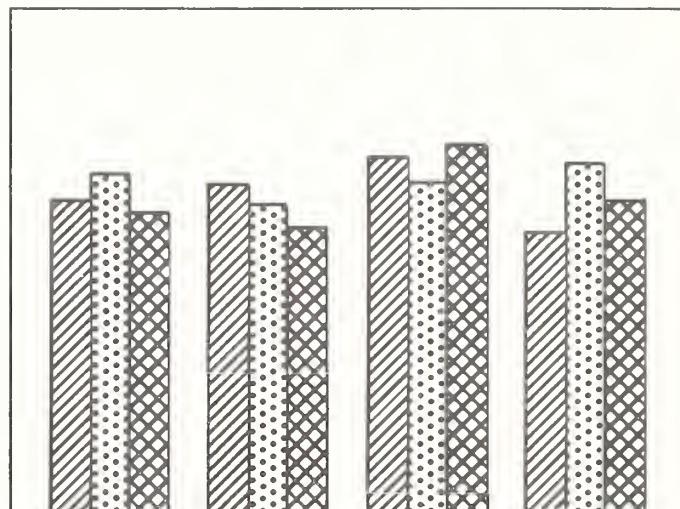

FIGURE 10.--Grouped bar graph.
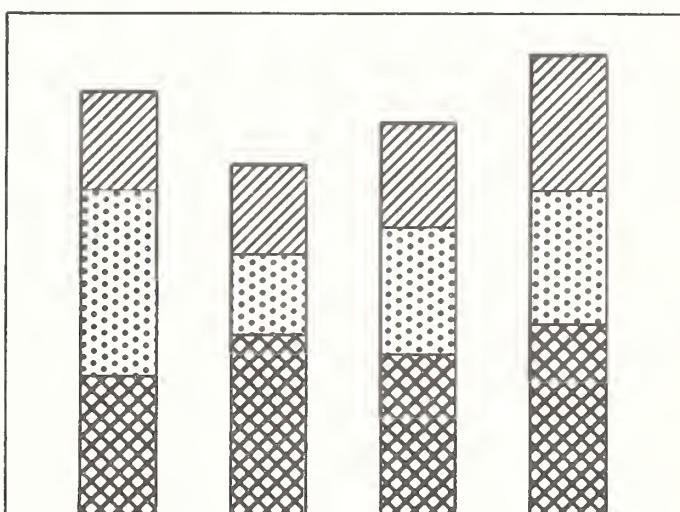
FIGURE 11.--Segmented bar graph.
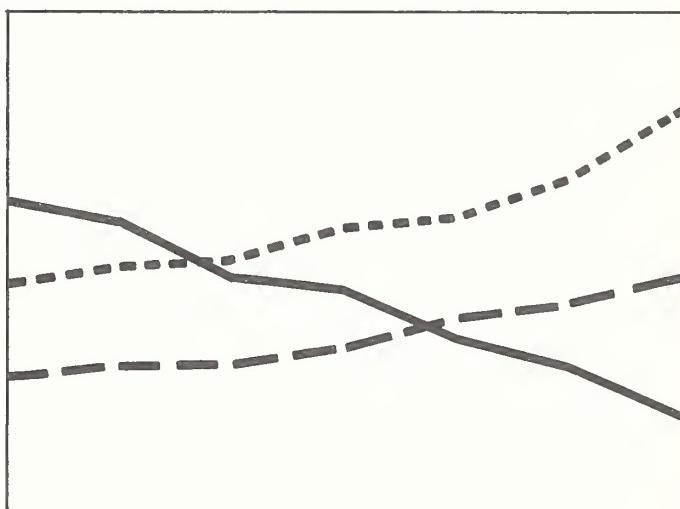
FIGURE 12.--Grouped line graph.

originated at the zero line of the graph; the size of the other elements had to be computed from the end of the preceding element. (See figure 14.) As expected, figures on the elements helped readers avoid misreading the size of elements in segmented graphs.

Figures on elements usually are easier to understand than grids...(Figures 14 and 15)

Seven pairs of graphs permitted comparison of grids vs. figures on elements for showing the quantities in graphs. Thus, 28 comparisons (7 graph pairs x 4 groups of people) were available.

Twenty of the comparisons favored figures on the elements, 11 of which were statistically significant; 7 comparisons favored grids, 3 of which were statistically significant. Those favoring grids were pairs of grouped bar graphs, while 4 of the 5 graph pairs in which figures on the elements scored highest were segmented bar graphs.

Labels are generally easier to read than keys...(Figures 16 and 17)

Ease of reading a graph with labels vs. keys was tested with 8 pairs of graphs. Twenty-two of 32 comparisons (8 graph pairs x 4 groups of people) resulted in higher average comprehension scores for graphs with labels than for graphs with keys to identify the elements. Differences between labels and keys were statistically significant in 8 of the 22 comparisons favoring labels.

Eight of the 32 comparisons favored keys over labels, 2 of these being statistically significant. Only 1 pair of graphs gave consistently higher average scores for the keys over the labels. This was with a pair of grouped bar graphs with figures on the elements.

10
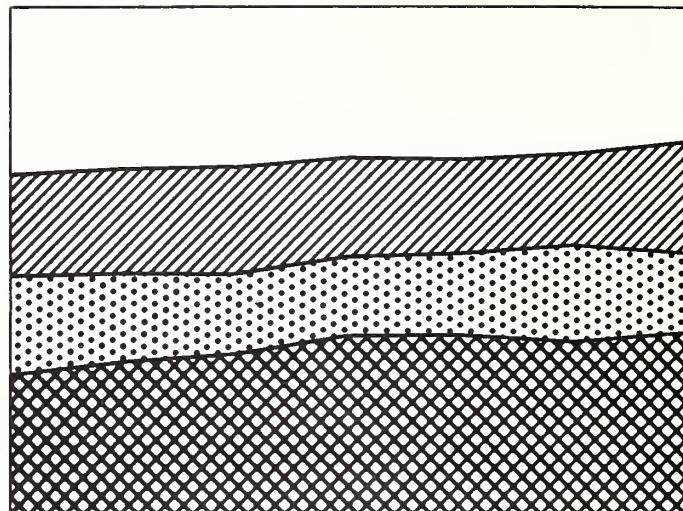
FIGURE 13.--Segmented line graph or surface chart.
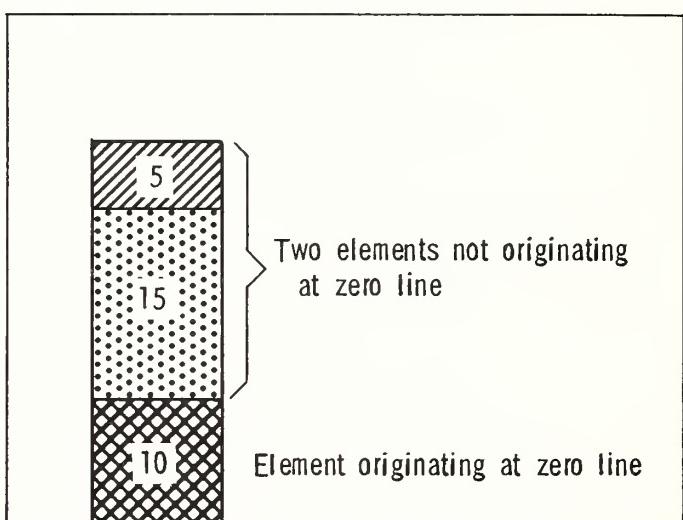
FIGURE 14.--Graph with figures on the elements to show quantities.
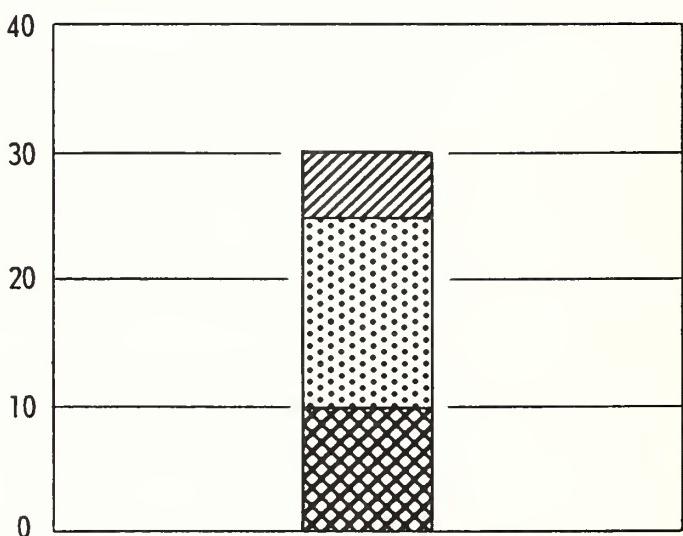
FIGURE 15.--Graph with grid to show quantities.
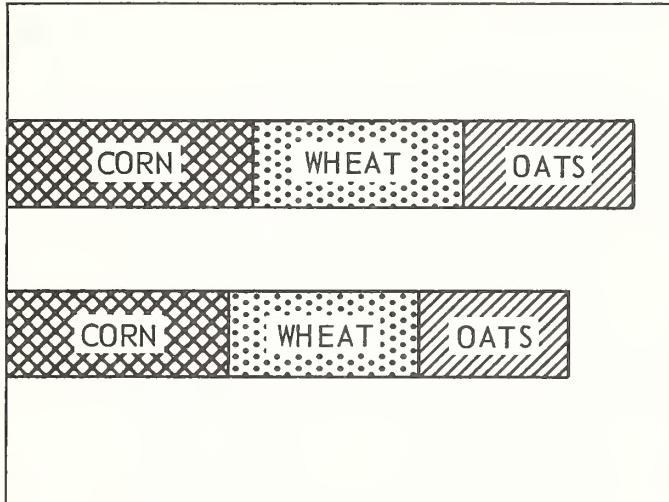
FIGURE 16.--Graph with labels on the elements.
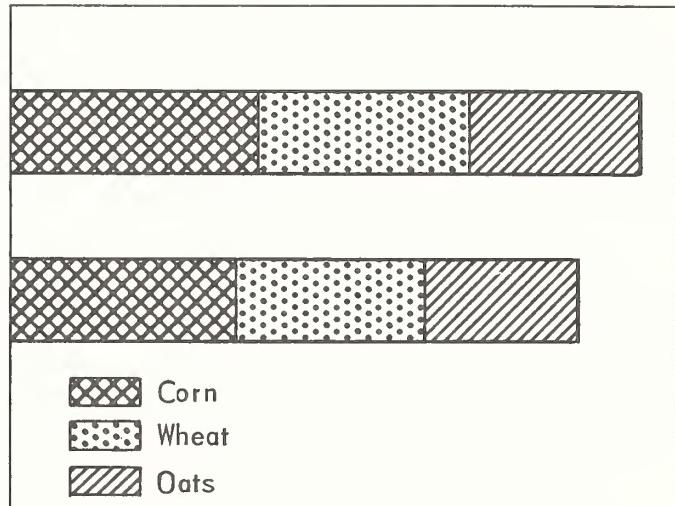
FIGURE 17.--Graph with key to identify elements.
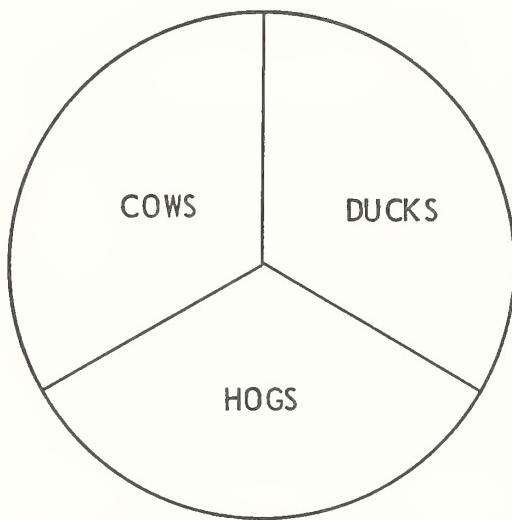
FIGURE 18.--Graph with labels to identify elements.
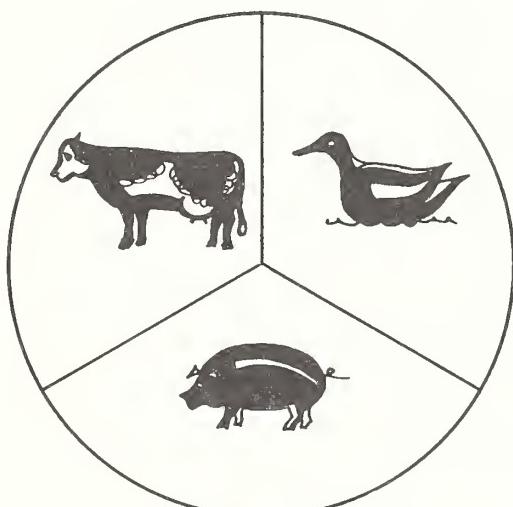
FIGURE 19.--Graph with pictorial symbols to identify elements.

Word labels or pictorial symbols are equally good (Figures 18 and 19). There was no appreciable difference in average comprehension scores between graphs with labels to identify the elements and those with pictorial symbols. Two pairs of graphs were available for this comparison -- one pair of circle graphs and one of bar graphs.

Pictorial symbols are better than keys. In two pairs of graphs designed to compare pictorial symbols vs. keys, both favored the symbols. In the 8 comparisons (2 graph pairs x 4 groups of people), 7 of the comparisons resulted in higher comprehension scores for the symbol-type graphs. No comparison favored keys over symbols.

Horizontal or vertical bars; take your pick. (Figures 20 and 21). Evidence from 4 pairs of graphs did not conclusively favor either horizontal or vertical bars. Three of 16 comparisons (4 graph pairs x 4 groups of people) showed no difference between horizontal and vertical bars; 3 of 8 comparisons favoring vertical bars were statistically significant; and 2 of 5 favoring horizontal bars were statistically significant.

A practical factor which may influence graph users to prefer horizontal bars is the ease of putting figures and labels on the elements of horizontal bars.
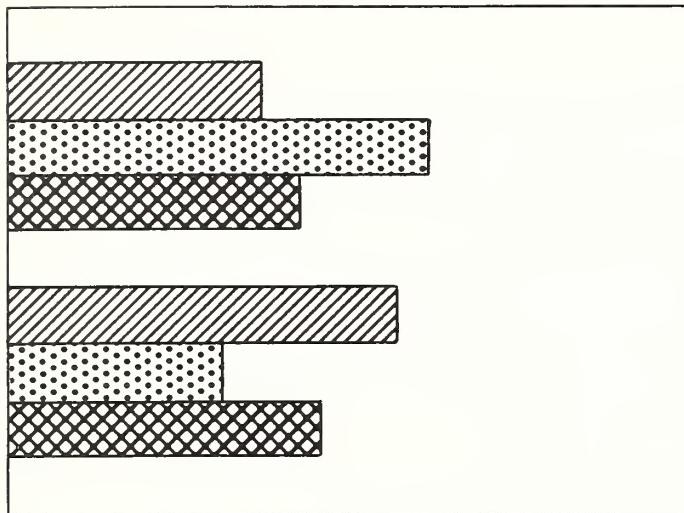
FIGURE 20.--Graph with horizontal grouped bars.
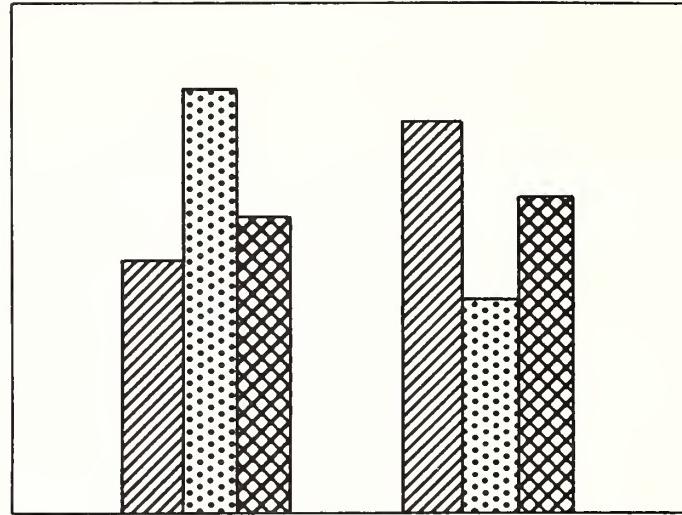
FIGURE 21.--Graph with vertical grouped bars.

CHAPTER IV -- PICK YOUR PURPOSE, THEN CHOOSE A GRAPH

Test questions in this study were designed to compare the effectiveness of several types of graphs for obtaining the kind of information discussed below. As expected when the tests were designed, some kinds of graphs proved better for some uses than for others. See pp. 4-6 of Chapter II for a description of the kinds of graphs and uses studied.

One set of sample graphs is used throughout this chapter to help the reader see the kind of graphs and uses being discussed. These samples, although not as complete as the graphs used in the tests, will give you an idea of the type of graph designs tested.

Estimating the relative size of four units--

The first operation for which the graphs were compared was estimating the relative size of four units. In the examples below, (Figures 22-25) this question becomes: In which year were United States grain exports largest?

The percentages of people selecting the correct answers were highest for the segmented formats. Test scores also showed that segmented bars were better than the segmented lines for this operation.

In estimating the relative size of the units, grouped graphs require an operation not needed with segmented graphs. The reader must add the values for each element in the group. This extra step introduces one more opportunity for the reader to make an error.

When the reader was merely comparing the relative size of units in a graph, it didn't seem to matter much whether figures on the elements or grids were used to show amounts. Nor did it seem to make any appreciable difference whether labels, keys, or symbols were used to identify the elements.

Estimating the value of one element in a graph --

A second kind of information that can be obtained from graphs is an estimate of the value (amount) represented by each element in the graph.

12
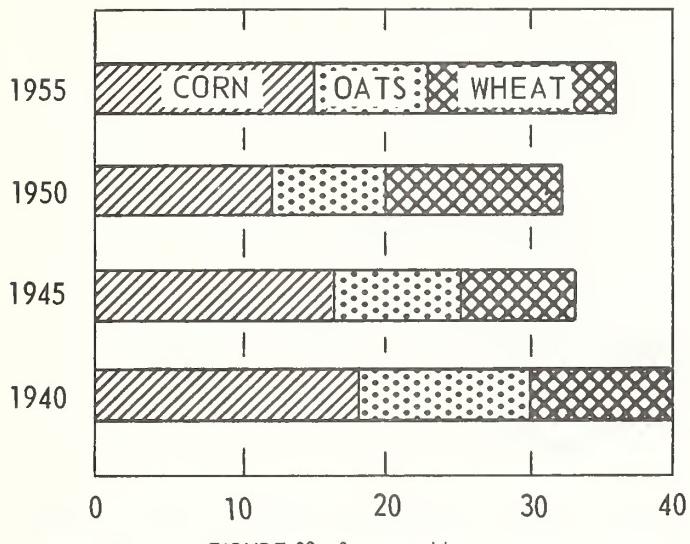
FIGURE 22.--Segmented bar.
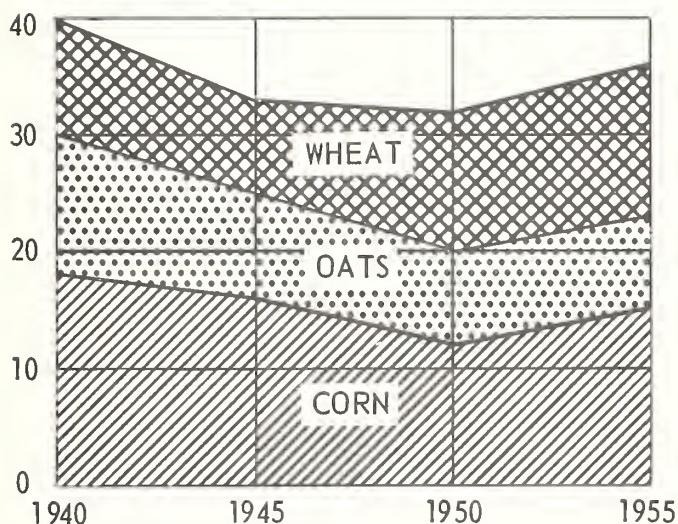

FIGURE 23.--Segmented line (or surface)
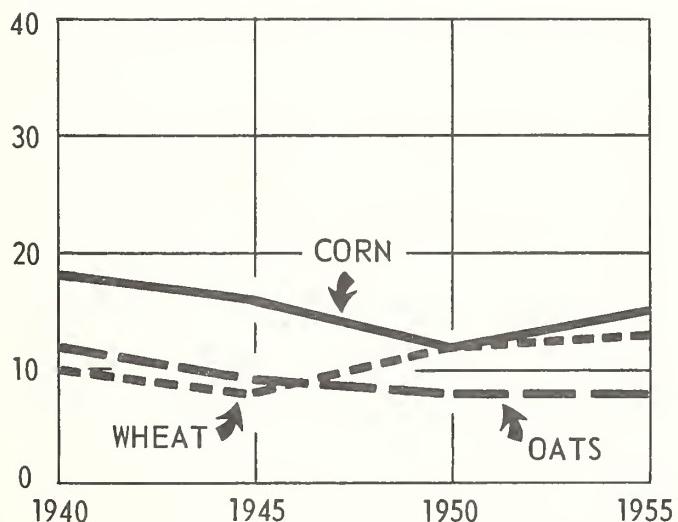
FIGURE 24.--Grouped line.

Comprehension scores for this operation were generally higher for elements touching the base line of the graph. Thus the grouped graphs had an advantage, since the size of all elements in a grouped graph are computed from the base line.

Only in a segmented format of bar and line graphs do some values originate at a point other than the zero line. There was no appreciable difference between the segmented or grouped format, nor between line graphs and bar graphs when the value could be computed from the zero line of the graph.

The differences in test scores favoring elements originating at the zero line were highly significant statistically.

In estimating the value of an element not originating at the zero line, the reader must locate the two ends of the element on the grid and subtract to get the value. These extra steps can be avoided on segmented bar graphs, however, by putting figures on the elements to show the value.

Four out of four comparisons favored figures on the elements for estimating the value of an element not originating at the zero line. Three of the four comparisons were highly significant statistically.

Comparing size of elements in the same unit --

The graphs below (Figures 26-29) show an example of this type of operation. In the example, the question is: How did the amount of corn exported in 1955 compare with the amount of wheat exported in 1955?

As you will see from the examples, you would compare parts A and C on the graphs.

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Among the bar graphs, the grouped bars were significantly better than segmented bars in all comparisons. If segmented bars are used, figures on the elements are a definite advantage. With the grouped bars, figures on the elements did not seem to offer any advantage for this operation.

To show percentage data (parts of a whole), circle graphs gave higher comprehension scores than percentage bars; the differences were not statistically significant, however.

Line graphs had the lowest comprehension scores for comparing the size of two elements in a unit. In four comparisons, bar


FIGURE 27.--Grouped bar.

FIGURE 25.--Grouped bar.
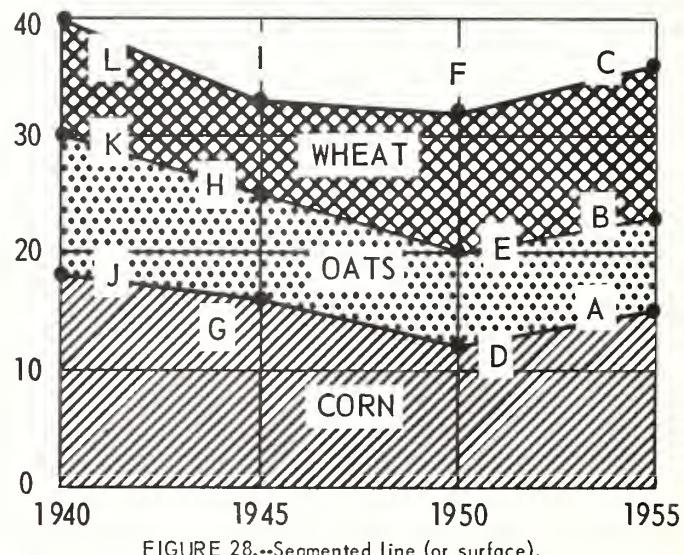
FIGURE 28.--Segmented line (or surface).


FIGURE 26.--Segmented bar.
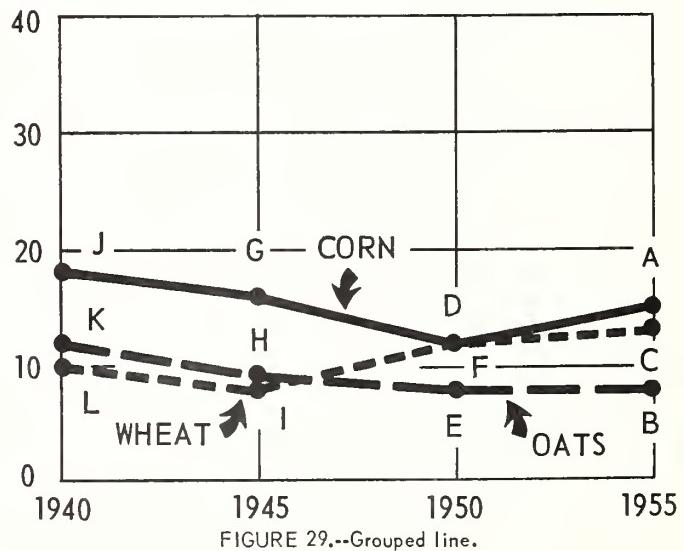
FIGURE 29.--Grouped line.

14

graphs had higher scores than line graphs, all highly significant.

Comparing similar elements in different units --

The sample question for this operation is: How did the amount of oats exported in 1940 compare with the amount exported in 1950?
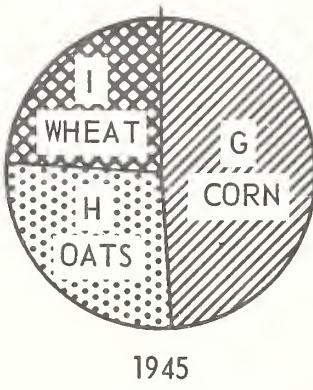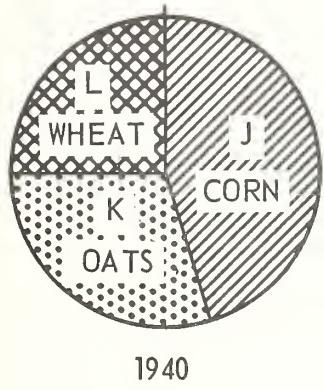
With circle graphs, (Figure 30) this operation required comparing segment E in one circle with segment K in another circle. With segmented bar graphs, (see Figure 26) it involved comparing segment E in one bar with segment K in another bar. In segmented line charts, (Figure 28) it involved comparing the size of a stratum larger at one point in time with the same stratum at another point in time.
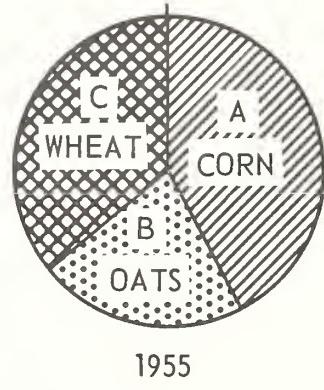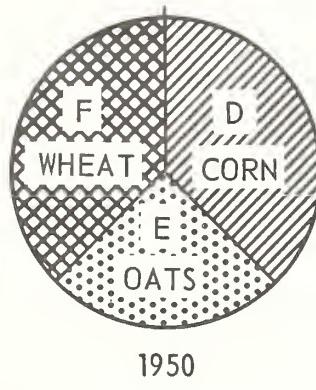

FIGURE 30

In 4 comparisons, the comprehension scores were higher for bar graphs than for line graphs, the difference being statistically significant. Among the bar graphs, the grouped format proved better, but only 1 of 4 comparisons was statistically significant.

In the comparison of circles and percentage bars, 1 comparison favored circles and 1 favored bars, both highly significant statistically. It would appear that circles and bars are about equally good for this operation.

Comparing different elements in different units --

To illustrate this operation, let's assume that we wanted to know how corn exports in 1950 compared with wheat exports in 1955. In our sample graphs (Figures 26-29), we would compare element C in one unit with element D in another unit.

Bars were better than line graphs for this operation in all 4 comparisons, 3 of which were statistically significant. Among the bar graphs, grouped bars resulted in higher comprehension scores in 5 out of 6 comparisons, 4 of which were statistically significant. In the comparison that favored segmented bars, the graphs had figures on the elements instead of grids to show quantities.

In the grouped graphs, remember that all of the elements originate at a common base line, making a visual comparison of length of bars relatively easy. With the segmented bar graph, however, one element might originate at the base line while the element with which it is being compared might originate at some other point.

In comparing figures on the elements with grids for this operation, 3 of 4 comparisons with segmented bar graphs favored

the figures; there was no difference between figures on the elements and grids for the fourth pair of segmented bar graphs. In 2 comparisons with grouped bars, 1 favored grids and 1 favored figures on the elements.

Percentage bars gave higher scores than circles for comparing different elements in different units. One of the two comparisons was statistically significant.

Estimating difference between two differently labeled elements in different units --

This operation goes one step further than the last one we discussed. We're interested not only in whether one element (C) is larger or smaller than another (D) but we want to know how much larger or smaller. (See Figures 26-29.) Here we ask: How many bushels greater were the corn exports in 1950 than the wheat exports in 1955?

Bar graphs scored significantly higher than line graphs in 3 of 4 comparisons. In comparing lines with bars, it was necessary to use grids to show quantities in all of the graphs, since line graphs with figures on the elements are not feasible.

It would seem that figures on the elements would be especially helpful for this operation because it would save one step. With grids, the reader must first estimate the values of each of the elements from the grid lines, then subtract. With figures on the elements, the reader merely has to read the figures from the graph and subtract.

In 5 of 6 comparisons, comprehension scores were higher for graphs with figures on the elements than for graphs with grids.

Four of these were statistically significant; but in the pair favoring grids the difference also was statistically significant.

Comprehension scores were higher for circle graphs than for percentage bar graphs on this operation. One of the two comparisons was statistically significant; the other was not.

Recommendations for Graph Design Based on Study Findings --

To compare the relative size of two or more units within a graph, the segmented bar graphs are recommended. (Figure 31)
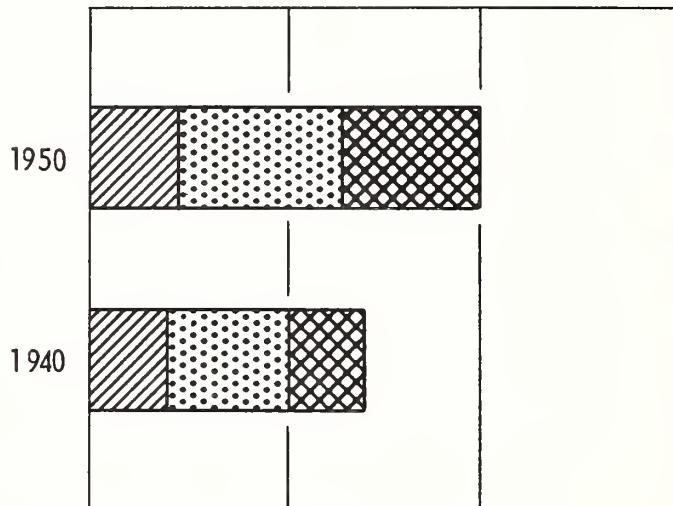
FIGURE 31

Other factors studied did not seem to make any appreciable difference in comprehension for this operation.

Estimating the value of one element in a graph is easiest when the element originates at the base line (zero line) of the graph. Thus, grouped graphs, especially grouped bars, are recommended. (Figure 32) Where the element does not originate at the zero line, as is the case with segmented bars, figures on the elements to show the values are very helpful. (Figure 33)

16
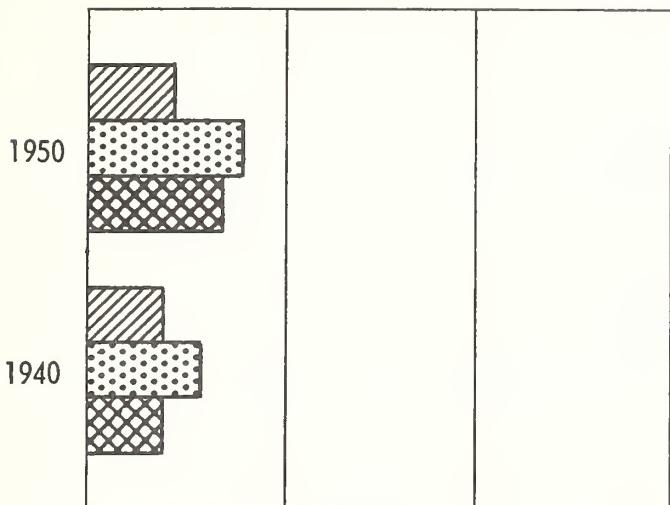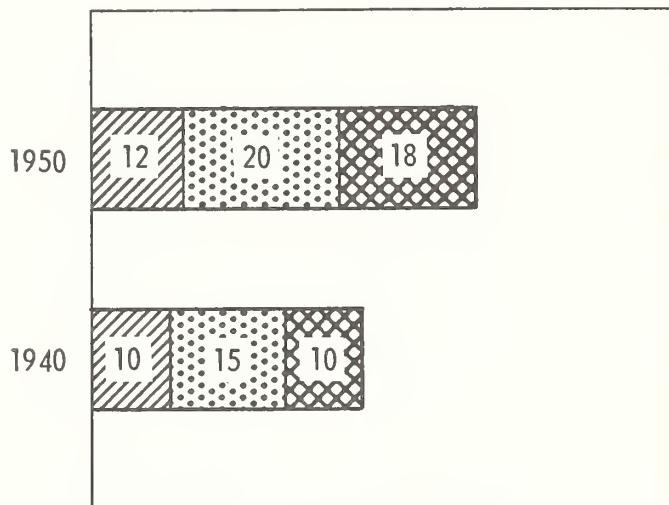
FIGURE 32

FIGURE 33

To compare the size of two elements in the same unit or in different units, grouped graphs are recommended; segmented graphs are less satisfactory. Bar graphs are recommended for these operations; line graphs are not recommended. Segmented bars may be used for these operations, if figures on the elements are used to show values.

To estimate the numerical difference between two elements in different units of a graph, bar graphs with figures on the elements are recommended.

When one or more of the above operations are combined for one graph, segmented bar graphs with figures on the elements are recommended.

CHAPTER V -- RELATION OF READER CHARACTERISTICS TO GRAPH COMPREHENSION

Questions to answer --

In this phase of the study, we sought answers to the following questions:

1. Does graph comprehension increase as the amount of formal schooling increases?

2. To what extent is IQ related to graph comprehension?

3. At different IQ levels, how does amount of schooling relate to graph comprehension?

4. To what extent are numerical reasoning, verbal reasoning, and abstract reasoning abilities related to graph comprehension?

How the data were analyzed --

Pearsonian correlations were computed to find how much association there is between IQ* and graph comprehension and between each of three aptitudes (numerical, verbal and abstract reasoning) and graph comprehension.

Next the data were cross-tabulated to show the relationship between comprehension scores, IQ, and school grade completed (Table 1).

The three IQ groups were established as follows: Persons in the three lowest

*IQ comparisons do not include the Farm Short Course students because IQ data were not available on that group.

deciles of IQ scores comprised the low group. Those in the three highest deciles comprised the high group. The other four deciles were the middle group.

The two levels of graph scores were established by putting all scores of less than 80 in the low group, and scores of 80-100 in the high group. The lower limit for the high group was set at 80 because that was the nearest 10 percent level to the average of all test scores. (The average was 78 percent.) The low group is approximately those below the average.

IQ and schooling related to graph scores--

Statistically significant relationships were found between graph comprehension and all reader characteristics tested except age.

In table 1 you will see a highly significant gain in graph comprehension as schooling increased among low IQ respondents. (Chi square P.001) While there was some gain in comprehension as schooling increased among middle and high IQ respondents, the gains were not statistically significant. (Chi square P .23 and .46 respectively.)

TABLE.--Relationship of Schooling to Graph Comprehension at Three IQ Levels for 412 Wisconsin and Ohio Vocational Agriculture Students

School grade completed	Percentage of students in--					
	Low IQ group whose graph scores were--		Medium IQ group whose graph scores were--		High IQ group whose graph scores were--	
	Below 80	80-100	Below 80	80-100	Below 80	80-100
6-8th	83.8	16.2	44.4	55.6	23.8	76.2
9th	85.7	14.3	46.9	53.1	34.7	65.2
10th	53.6	46.3	30.2	69.8	18.5	81.5
11th	45.9	54.2	34.2	65.8	18.1	81.8
Total . . .	65.2	34.8	38.6	61.4	23.7	76.3

The most marked change in comprehension occurs at the 10th grade level. This suggests, but does not prove, that a plateau in graph-reading ability is reached during the 10th grade by low IQ respondents. It may be reached earlier by middle and high IQ respondents.

You will note in the total row at the bottom of table 1 that as the IQ level increased graph comprehension became significantly higher. About 3/4 of the high IQ group scored 80 or above, while 3/5 of the middle IQ group and only 1/3 of the low IQ group scored that high. (Chi square P.001)

These comparisons indicate that people in the middle and upper IQ levels who have completed 8th grade can understand graphs like the ones tested and that people in the lower IQ level can learn to read them. A further implication may be that if people who prepare graphs are in the high IQ level, their own ability to interpret a graph is not a safe basis for assuming that people generally will be able to interpret it.

Aptitudes in relation to graph scores --

In the correlation analyses, graph comprehension was positively associated at a statistically significant level with IQ and each of the three aptitudes -- verbal reasoning, numerical reasoning, and abstract reasoning. (For IQ and graph comprehension r was .43; for each of the three aptitudes r was about the same, .55. An r of .25 was statistically significant.)

It was thought that people high in one kind of aptitude might understand graphs better, but the tests did not support this. However, there was an indication that certain aptitudes correlated more closely with comprehension of graphs containing three or four difficult features.

Summary

1. Amount of schooling for the high school students tested was significantly related to graph comprehension only among the lower IQ group.

2. IQ was related to graph comprehension at a highly significant level.

3. Numerical, verbal, and abstract reasoning were significantly related to graph comprehension.

CHAPTER VI -- UNANSWERED QUESTIONS ABOUT GRAPHS

Much graph research still is needed to provide a better basis for using graphs to communicate effectively with the American public. The types of research needed include:

1. Additional studies of comprehension for graph designs and uses not included in this study.

2. Studies of immediate and delayed recall of information contained in graphs and how graph design may affect recall.

3. Studies of readership of graphs in general and how variations in graph design affect readership.

Additional comprehension studies

A needed study most closely related to the present study is one on effectiveness of different types of graphs for showing trend data. It generally has been assumed that line and surface graphs are best for showing trends. However, there are some indications that under some conditions bars may be equally as good as or better than lines for trends. Harold Parker, a graduate student at the University of Wisconsin, is studying this problem.

The number of elements that can be included in a graph for maximum effectiveness is another question facing authors, editors, and graph designers. One school of thought is that the maximum is three elements -- that is, three lines in a line graph or surface chart, three segments per bar in a segmented bar graph, etc. This undoubtedly may vary with the intended use of the graph, and with the amount of time the audience will spend looking at the graph; but, it hasn't been tested.

The time factor cited above suggests another study. How long will people spend looking at various kinds of graphs? How much information can they get from different kinds of graphs with varying exposure times? The first of those two questions calls for a readership study;

the second calls for an experimental design in which graphs of different designs are each shown to paired subjects for different amounts of time, ranging from a fraction of a second to several seconds.

In relation to bar graphs, how does the ratio of width to length of a bar influence people's perception of the magnitude of the value the bar represents? This is a basic study in perception that could be conducted apart from a graph study. A similar type of study is needed on vertical vs. horizontal bars. When a person views a horizontal bar and a vertical bar, both the same length on the same page with no other symbols, does he perceive one of the bars as longer than the other?

Many other aspects of graph design could be tested to find their influence, if any, on comprehension. Among them would be color, titling, shading or other means to sharpen contrast among elements, number and sharpness of grid lines, and so forth.

To be of most help to graph designers, a comprehension study should show what kind of errors people make on each interpretive operation with each kind of graph. This could easily be included in the design of the comprehension studies suggested. The alternative answers provided in a multiple choice test would include values appropriate for the kind of errors it is assumed that people are most likely to make on a given operation. The data could then be tabulated and analyzed to show the more common errors in graph reading.

Recall studies --

After the best graph designs have been selected from the study reported here and from the needed studies listed above, a

series of recall tests would be valuable. This would help graph designers, authors, and editors learn whether the information that people remember from a graph parallels their immediate comprehension for various kinds of graphs. The recall tests should include both immediate and delayed recall.

Studies of the attention people will give to graphs --

After researchers and designers have worked together to provide the most understandable graphs possible, then studies of attention to graphs should be made. These should include not only general attention to graphs in the context in which they are used, but experimental studies of factors that influence the amount of attention people give to graphs.

The attention studies could attack such questions as: What factors of design -- color, animation, and so on -- influence the number of people looking at a graph and how long they look? To what extent do some attention devices detract from the message the graph was designed to present? What factors in graph design will increase both attention to the graph and the understanding of its content?

Relation of the present study to future work is assumed to be as follows: The first step in studying the effectiveness of graphs is to find out how much and what kind of information people can get from different kinds of graphs with the graphs in front of them. The next step is to see how much and what kind of information people remember from the best graphs used in step one when their attention is directed to the graphs. The third step is to see how much attention people will give to different kinds of graphs with a given content when the graphs appear in the context of a publica-

tion or other presentation. What factors will increase the attention and amount of information remembered by those who see the graphs.

It is reasonable to expect that the prin-

ciples of attention, perception, and memory established by educational and psychological research will apply to graph design and use. These principles should be helpful to anyone undertaking any of the future studies suggested in this report.

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APPENDIX: SOME DETAILS ABOUT THE STUDY DESIGN

Who Did What . . . .

The design for this study was developed by Bryant E. Kearl and Richard D. Powers of University of Wisconsin. L. E. Sarbaugh of the Office of Information, U.S. Department of Agriculture, checked test materials and handled clearance of the project, agreement, and test materials in Washington, D. C. He also arranged for and administered the tests in Ohio.

Two graduate students in the University of Wisconsin's Department of Agricultural Journalism chose the study as their research project. Hugh M. Culbertson conducted the first phase early in 1958; Thomas G. Flores conducted the second phase of the analysis. Full reports of their research are available on microfilm, as stated in the preface.

The tests used in this study consisted of 25 graphs, each with 4 to 7 questions, to elicit the interpretive operations listed in chapter II. The sequence of the tests was determined by selecting 3 sets of 25 numbers from tables of random digits. These sets of numbers were then used to arrange the tests in three different ways (forms) within the test booklets. This was to offset the effect of respondents' fatigue on test scores. Forms were alternated when the test was administered so adjacent students were using different forms. A questionnaire regarding personal characteristics of the respondent appeared on the cover sheet of each test booklet.

Three general groups were tested to determine their comprehension of the graphs. These were 107 Farm Short Course students at the University of Wisconsin, some 250 students in four Wisconsin high schools, and about 300 students in several Ohio high schools.

Cooperating in these tests were J. F. Wilkinson, University of Wisconsin Farm Short Course Director; G. W. Sledge, University of Wisconsin Agricultural Education Department; Wisconsin high school vocational agriculture instructors Arthur Kautza, Daniel Shied, William Boyle, and Fenton Abrams; University of Wisconsin student teachers; Ohio high school vocational agriculture teachers H. E. Ridenour, Raymond S. Rickly, Paul H. Gipp, D. C. Rice, John T. Starling, Leon Boucher,

Darl Dean, A. H. Hummell, Warren L. Reed, Carl E. Nagy, and Carl R. Stotz; and Miss Vicki Burcalow, Miss Janice Christensen and Mrs. Leona Neal, who helped score and record the tests.

Short Course students also took three of the Differential Aptitude Tests published by Psychological Corporation, New York. These were tests for Verbal Reasoning, Numerical Ability, and Abstract Reasoning. Intelligence Quotient scores were obtained, where possible, for the high school pupils tested.

Thus, the results with Short Course students provided data for studying the relationship of various aptitudes to graph comprehension, while the high school scores allowed studies of the relationship between IQ and graph comprehension. These are discussed in Chapter V.

Culbertson's research paper reports results from the Farm Short Course study. Later, he analyzed results from the Wisconsin high school testing as a check on results from the Farm Short Course. These results were reported in the Audio Visual Communication Review, volume 7, number 2, Spring 1959. Reprints are available from the University of Wisconsin Department of Agricultural Journalism, or from the USDA Office of Information.

Culbertson analyzed comprehension scores to determine the general suitability of the various types of graphs and the relation of graph comprehension to intelligence and aptitudes. Flores analyzed the answers to each of the questions asked for each graph to find the suitability of the different graph forms for each of the interpretive operations studied.

Thus, Culbertson and Flores each used the data gathered from the tests in Ohio

and Wisconsin. Culbertson's data were the number of correct answers on each graph, the general percentage of answers correct for all 25 graphs, and the individual characteristics of students tested. Flores' data were the correctness or incorrectness of each of the 162 answers to questions accompanying the graphs.

Most common statistical test used was the t-test of differences between means and proportions for the various graph pairs. Culbertson ran some correlational analyses and t-tests on differences between correlation coefficients; Powers analyzed some data with Chi Square and non-parametric techniques.

Example of Reasoning in Analysis of Data. . . .

An examination of the reasoning process in arriving at a specific conclusion may help clarify some of the procedures in handling the data.

Culbertson concluded that line graphs generally were less satisfactory than bar graphs. These variables were contained in 12 graphs, allowing comparison of 6 pairs of graphs in which one member of the pair differed from the other only in respect to the line or bar variable.

Each group of respondents provided an average number of correct answers to the questions accompanying each of these 12 graphs. The average score of Farm Short Course students was always higher

for the bar form of the graph, and in each case, the difference was statistically significant. The average score of pupils in the first Wisconsin high school group was likewise always higher for the bar form than for the line form, again statistically significant in each case. The comparisons for the other two Wisconsin high school groups was much the same, but the difference in favor of the bar failed to reach significance for one pair of graphs. The Ohio pupils, considered as one group, gave the same conclusions. Actually, Culbertson and Powers conducted sign tests on the Ohio pupils' scores in each school and found only one instance where the average score on a line graph exceeded the average score on the comparable bar graph form.

Flores' analysis was similar, but he considered scores on each question, rather than the overall score on the graph.

Thus, the design afforded many opportunities for differences to show up. The fact that the differences almost invariably favored the bar form of the graph gives ample evidence that this form was more comprehensible for the operations included in this study.

The same type of reasoning was applied to other comparisons made in the study. Below is a list of the pairs of graphs used to investigate the influence of the variables included in this study. The listing also shows which variables were held constant in the pairs compared.

PAIRS OF GRAPHS USED FOR EACH VARIABLE INVESTIGATED
(Variables being compared are underlined)

Lines versus Bars

*1-35   Labeled segmented line chart with grid
1-34   Labeled segmented horizontal bar graph with grid

1-36   Labeled grouped line chart with grid
1-33   Labeled grouped horizontal bar graph with grid

1-43   Keyed segmented line chart with grid
1-24   Keyed segmented horizontal bar graph with grid

1-44   Keyed grouped line chart with grid
1-25   Keyed grouped horizontal bar graph with grid

1-44   Keyed grouped line chart with grid
1-29   Keyed grouped vertical bar graph with grid

1-43   Keyed segmented line chart with grid
1-28   Keyed segmented vertical bar graph with grid

Keys versus Labels

1-24   Keyed segmented horizontal bar graph with grid
1-34   Labeled segmented horizontal bar graph with grid

1-25   Keyed grouped horizontal bar graph with grid
1-33   Labeled grouped horizontal bar graph with grid

1-27   Keyed grouped horizontal bar graph with figures
1-32   Labeled grouped horizontal bar graph with figures

Keys versus Labels

1-37   Keyed circle graph with figures
1-38   Labeled circle graph with figures

1-43   Keyed segmented line graph with grid
1-35   Labeled segmented line graph with grid

1-44   Keyed grouped line chart with grid
1-36   Labeled grouped line chart with grid

1-47   Keyed 100% bar graph with grid
1-40   Labeled 100% bar graph with grid

1-39   Keyed 100% bar graph with figures
1-48   Labeled 100% bar graph with figures

Symbols versus Labels

1-41   Symbol-type grouped horizontal bar graph with grid
1-33   Labeled grouped horizontal bar graph with grid

1-42   Symbol-type circle graph with figures
1-38   Labeled circle graph with figures

Symbols versus Keys

1-41   Symbol-type grouped horizontal bar with grid
1-25   Keyed grouped horizontal bar graph with grid

1-42   Symbol-type circle graph with figures
1-37   Keyed circle graph with figures

Horizontal versus Vertical Bars

1-24   Keyed segmented horizontal bar graph with grid
1-28   Keyed segmented vertical bar graph with grid

*Numbers refer to graph number on the test form.

Horizontal versus Vertical Bars

1-25 Keyed grouped <u>horizontal</u> bar graph with grid
1-29 Keyed grouped <u>vertical</u> bar graph with grid

1-26 Keyed segmented <u>horizontal</u> bar graph with figures
1-30 Keyed segmented <u>vertical</u> bar graph with figures

1-27 Keyed grouped <u>horizontal</u> bar graph with figures
1-31 Keyed grouped <u>vertical</u> bar graph with figures

Segmented versus Grouped Arrangement

1-24 Keyed <u>segmented</u> horizontal bar graph with grid
1-25 Keyed <u>grouped</u> horizontal bar graph with grid

1-26 Keyed <u>segmented</u> horizontal bar graph with figures
1-27 Keyed <u>grouped</u> horizontal bar graph with figures

1-28 Keyed <u>segmented</u> vertical bar graph with grid
1-29 Keyed <u>grouped</u> vertical bar graph with grid

1-30 Keyed <u>segmented</u> vertical bar graph with figures
1-31 Keyed <u>grouped</u> vertical bar graph with figures

Segmented versus Grouped Arrangement

1-34 Labeled <u>segmented</u> horizontal bar graph with grid
1-33 Labeled <u>grouped</u> horizontal bar graph with grid

1-35 Labeled <u>segmented</u> line chart with grid
1-36 Labeled <u>grouped</u> line chart with grid

1-43 Keyed <u>segmented</u> line chart with grid
1-44 Keyed <u>grouped</u> line chart with grid

100% Circle versus 100% Bar

1-37 Keyed 100% <u>circle graph</u> with figures
1-39 Keyed 100% <u>horizontal bar graph</u> with figures

1-38 Labeled 100% <u>circle graph</u> with figures
1-48 Labeled 100% <u>horizontal bar graph</u> with figures

Graph Test Schedule and Sign Test Data...

The test schedule and the sign test data are not included in this report. If you would like copies of these items, write to:
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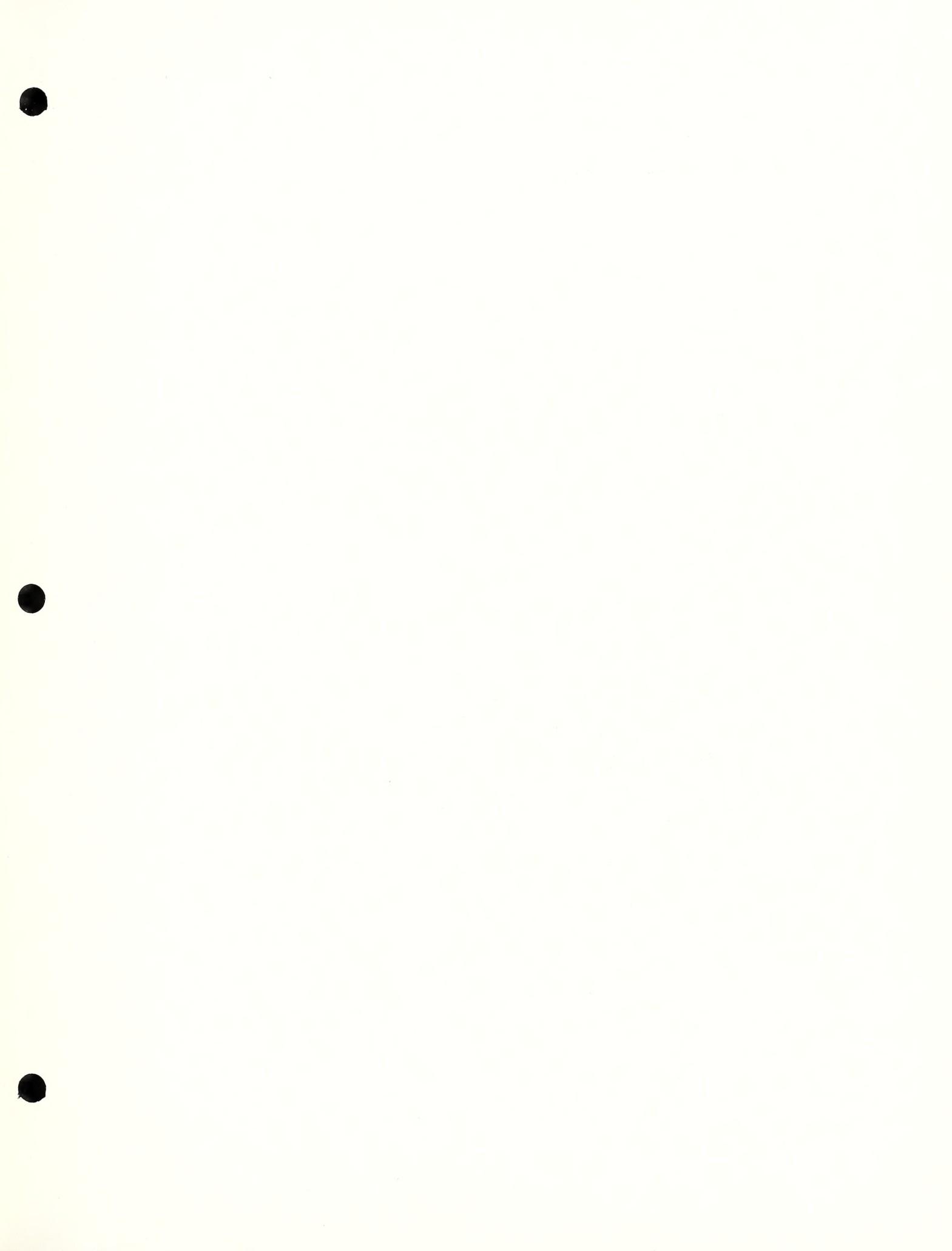
COMPLETE LIST OF AGRICULTURAL JOURNALISM DEPARTMENT BULLETINS

Copies of bulletins still in print can be obtained by writing the Department of Agricultural Journalism, University of Wisconsin, Madison, Wisconsin. Starred titles are out of print.

Number and Date		Title
1	1929	Editing the Agricultural College Magazine
*2	1929	The Popular Bulletin as a Means of Communicating Agricultural Information
*3	1930	Research in Agricultural Journalism
*4	1930	A Survey of Rural Bank Advertising in Wisconsin
*5	1935	Listening to Farm Broadcasts
*6	1935	My Autobiography--Herbert W. Collingwood, editor of the Rural New Yorker
7	1936	Measuring Format and Style of Agricultural College Bulletins, Part I
8	1936	Measuring Format and Style of Agricultural College Bulletins, Part II
9	1936	Measuring Format and Style of Agricultural College Bulletins, Part III
*10	1938	Revenue Sources of Country Weekly Newspapers
*11	1941	What Makes People Change Their Minds
*12	1942	A Source Survey of Agricultural News in the Daily Press
*13	1948	An Analysis of War News in a Country Weekly
*14	1949	Identifying Type Families
15	1949	National Survey of Agricultural College Editors
16	1949	Content of Selected U. S. Dailies
*17	1950	Proportions for Bulletin and Booklet Illustrations and Layouts
18	1952	Weaknesses in Technical Writing
*19	1952	Back Shop Manhours in 20 Wisconsin Weekly Newspaper Plants
20	1953	Making the Most of Television Time (Revised 1956)
21	1954	Direct Mail Announcement of Agricultural Publications
22	1955	Length, Detail, and Farmer Acceptance of Agricultural Publications
23	1955	Tele-Visual Board
24	1956	When Words Need Help--Graphic Presentation
25	1956	Frequency of Economic Terms and Concepts in Farm Magazines
*26	1956	Newspaper and Magazine Circulation in Rural Wisconsin
27	1957	Factors Influencing Knowledge of Technical Soils Concepts by Wisconsin Farmers
28	1958	Time Use Patterns and Communication Activities of Wisconsin Farm Families in Wintertime
29	1959	Using Graphs more Effectively for Economic Information
30	1960	Comprehension of Pictorial Symbols: An Experiment in Rural Brazil
31	1961	Comprehension of Graphs